UNINTENTIONAL TRAUMATIC INJURY AND HEARING ACUITY AMONG CENTRAL OHIO CASH GRAIN FARMERS: A CASE-CONTROL STUDY

Capstone Project

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By

Marie Vetter

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Capstone Committee:

Lawrence L. Feth, Ph.D., Advisor
J.R. Wilkins III, B.C.E. Dr.PH.
Christina Roup, Ph.D.
Gail Whitelaw, Ph.D.

Approved by

_____
Advisor

ABSTRACT

Farming has been identified since the late 1930s as one of the most hazardous occupations in the world, but in general has the least regulation and laws to protect agricultural workers. Several studies have found a higher prevalence of hearing loss among farmers as compared to their non-farming peers. The purpose of this case-control study was to examine the relationship between unintentional injury and hearing threshold levels (HTLs) among male principal operators (PO) living and working on central Ohio cash-grain farms using data from the Ohio Farm Family Health Survey (OFFHS). Five hundred ten male POs participated in Phase 2 of this study where hearing threshold levels were used to assess the risk between HTLs and injury risk. The most noteworthy result was that thresholds poorer than 25 dB for 6000 Hz in the left ear resulted in an OR of 3.35 (p=0.01, 95% CI=1.29-8.73) increased risk for injury compared to those subjects with thresholds 25 dB or better for 6000 Hz in the left ear after controlling for several potential confounders using multivariable logistic regression. Other significant findings for injury risk for those with >25 dB HTLs were the right, left, and binaural threshold at 6000 Hz, left high-frequency pure tone average, and binaural 500 Hz and 1000 Hz. Based on the p-value and 95% CI, four final ORs were found to be statistically significant (Lt 500, Lt 1000, Lt 6000, Bi 1000). Hearing conservation programs as well as audiometric testing at 6000 Hz for this population will help to reduce the incidence of hearing loss, therefore, likely reducing injury risk among agricultural populations.

DEDICATION

This paper is dedicated to my grandparents, as they are farmers and taught me the value of education and commitment. It is because of them experiencing hearing loss, due to loud machinery, that I became interested in the profession of audiology and hearing conservation.

ACKNOWLEDGMENTS

I would like to thank Jay Wilkins who was very patient and helpful during this capstone project. My appreciation of epidemiology and public health has grown even more. My family and other farm families are indebted to researchers like him, who are helping improve the quality of life in agricultural settings. I would also like to thank Larry Feth, who was able to put me in contact with Jay Wilkins and the College of Public Health, School of Epidemiology. His advice, guidance, and the allowance for learning have been wonderful. A special thanks to Angie Ingraham and Anna Strange, who helped guide and support me during capstone writing problems. Lastly, I would like to thank my fellow classmates who I spent endless hours with. Your support, experience, and knowledge have helped turn me into the audiologist I am today. I could have not done this without all of you. Thank you so much.

VITA

February 28, 1982. . . . . Born – Torrington, WY

May 2002. . . . . .Associate of Science
Eastern Wyoming College.

May 2005. . . . . .Bachelor of Arts
University of North Dakota

2006-2008 . . . . . .Research Assistant, Psychoacoustics Lab
The Ohio State University.

2007 . . . . . .Research Assistant, Department of Epidemiology
The Ohio State University.

2007-2008. . . . . Teaching Assistant, Department of Speech and Hearing Science
The Ohio State University.

FIELDS OF STUDY

Major Field: Audiology
Specialization: Public Health

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

PO	principal operators
HTLs	hearing thresholds levels
dB	decibel
LPTA	low pure-tone average
HPTA	high pure-tone average
Hz	hertz
SD	standard deviation
CI	confidence interval
cOR	crude odds ratio
aOR	adjusted odds ratio
OR	odds ratio
Rt	right ear
Lt	left ear
Bi	binaural average
RR	risk ratio

CHAPTER 1

Introduction

AGRICULTURE AND INJURIES

Farming has been considered since the late 1930's as one of the most hazardous occupations in the world, but has the least regulation and laws to protect farmers (Schenker, 1996). Several studies have shown that farmers have a higher prevalence of noise-induced hearing loss compared to their age-comparable non-farming peers (Thelin et al., 1983; Marvel et al., 1991; Plakke and Dare, 1992; Gomez, et al., 2001; McBride et al., 2003). For example, Kerr McCullagh, Savik, and Dvorak (2003) studied the hearing thresholds levels (HTLs) of farmers and construction workers. They reported that 67% of farmers in their sample had hearing thresholds greater than 25 dB at 4000 Hz, which is suggestive of noise-induced hearing loss. In contrast, Karlovich, Wiley, Tweed, and Jensen (1988) found no significant difference in HTLs between farmers and non-farmers in a rural area in Wisconsin. The key principal finding was that males in rural areas had poorer thresholds compared to females in the same rural area. Crawford et al. (1998) found the one-year incidence of male principal operators (POs) who experienced an injury was 5.0 per 100 person-years. Browning, Truszczynska, Reed, and McKnight (1998) examined farmers and found an injury rate of 9.0 per 100 farmers. Park et al. (2001) found a cumulative incidence of 10.5% in their study of Iowa farmers. Lyman, McGwin, Enochs, and Roseman (1999) estimated the injury rates of both black and white farmers. They found that 23.4% of the 1,310 farmers had experienced a farm-related injury. White farmers had a higher percentage of injuries compared to black farm workers or black farm owners. Farms with fewer than 11 employees do not have any governing body to enforce safety laws, unlike

other occupational settings or larger farms that require adherence to Occupational Safety and Health Administration (OSHA) safety laws (Schenker, 1996). Possibly due to this lack of oversight supervision, work-related injuries have not declined as in other industries that have regulations implemented by Federal and state governing bodies (Schenker, 1996).

A small number of previous studies have examined injuries in farming populations with respect to hearing loss as a potential risk for agriculture-related injuries (Browning et al., 1998; Crawford et al., 1998; Lewis et al., 1998; Hwang et al., 2001; Sprince et al., 2003; Choi et al., 2005; Sprince et al., 2007). Most of these studies relied on self-report of hearing loss as opposed to audiometic assessment of hearing threshold levels. Choi et al. (2005) examined associations between self-report of hearing loss and audiometric findings and the relationship of both to injury risk. It was reported that self-report of hearing loss had higher injury risk compared to those farmers with hearing loss, classified by their audiometric data. Crawford et al. (1998) found that age (under 30) was a significant factor for injuries among Ohio farmers in addition to self-report of hearing loss.

OCCUPATIONAL INJURY AND NOISE

Research has also been performed examining hearing acuity and injury risk in other occupational settings such as firemen and steelworkers. Hearing loss was found to be a significant risk factor for injury in a number of studies (Zwerling et al., 1997; Barreto, Swerdlow, Smith, & Higgins, 1997; Zwerling et al., 1998; Ide, 2007). Although most of these studies found hearing loss to be a significant risk factor when examining the self-report of hearing loss, Ide (2007) examined the audiometric thresholds of firefighters to determine hearing loss as a significant risk factor. Ide (2007) found that 0.09% of injuries occurred with firefighters who had hearing loss, which revealed no significance of hearing loss to injury risk.

OTHER RISK FACTORS FOR INJURY RISK

Limited research has also investigated other noise related factors which may explain injuries. Viljoen, Nie, and Guest (2006) found no association between hearing loss and injury risk but, they did find that accidents occurring to coal-miners with a known hearing loss under the age of 29 may have been influenced by their hearing loss. This significant risk factor may be due to the fact that younger workers have not yet acclimated to their environment and rely more on their senses, as compared to their well-acclimated and older co-workers. Moll van Charante and Mulder (1990) examined how the work environments affect employees with respect to injury risk. It was found that in quiet working conditions (<82.5 dBA) or in low job-related hazards, injuries increased for men with hearing loss compared to those men without hearing loss (OR 1.90). Noise levels greater than 82.0 dBA in the work environment contributed significantly to the risk of injury for male shipyard workers (OR 1.81).

HEARING ACUITY AND NOISE DEFINITIONS

Normal hearing is defined as thresholds less than or equal to 25 dB from 250 Hz to 8000 Hz (ASHA, 1990). Thresholds that are greater than 25 dB, indicates a hearing loss. Three different types of hearing loss can occur: conductive, sensorineural, or mixed. The audiometric indication of a conductive hearing loss is normal bone conduction thresholds with pure-tone air conduction thresholds poorer than 25 dB and an air-bone gap greater than 10 dB. Sensorineural hearing loss is indicated through audiometry by pure-tone air and bone conduction thresholds poorer than 25 dB with no air-bone gap greater than 10 dB. The audiometric indication of a mixed hearing loss is pure-tone air and bone conduction poorer than 25 dB with an air-bone gap greater than 10 dB. The type, degree, and configuration of the hearing loss are determined by audiometry. Excessive noise exposure may cause a sensorineural hearing loss, which is

characterized by a high-frequency hearing loss with a noise notch present between 3000-6000 Hz. It is often accompanied by tinnitus and loudness recruitment (Cooper & Owen, 1976; Ward, 1979).

NOISE-INDUCED HEARING LOSS PREVENTION

Engineering, education, and enforcement are methods used to prevent noise-induced hearing loss. Engineering strides to reduce machine noise to safer output levels have been done, but farmers do not always have the need or desire to upgrade to this safer equipment. Because enforcement by OSHA is not required for farms with fewer than 11 workers (Schenker, 1996), enforcement cannot be utilized effectively to reduce the incidence of noise-induced hearing loss among small farm populations. Education of farm families and their employees can be an effective way to prevent hearing loss. Previous research has shown that only 17% of the farmers interviewed wear hearing protective devices (HPD) when exposed to loud noises (McCullagh, Lusk, & Ronis, 2002). Wilkins et al. (1998) found that of the 1700 respondents questioned, 2/3 of them never wear hearing protection when around loud farm machinery and noise. Jenkins et al. (2007) found that only 30% of the farmers interviewed wear hearing protection consistently when exposed to loud noises. In addition, 33.8% of the women helping on the farm more than 20 hours a week wear hearing protection compared to those women helping with farm chores less than 20 hours a week (24.6%) (Meeker, Carruth, & Holland, 2002). Jenkins et al. (2007) found that after intervention and education to farm families and employees, use of HPDs increased significantly.

Many of the previous studies have utilized self-report questionnaires to report hearing loss or only examined the threshold level at one frequency in one ear. The purpose of this case-

control study was to examine the relationship between injury and (HTLs) among male POs living on Ohio cash-grain farms using data from the Ohio Farm Family Health Survey (OFFHS).

CHAPTER 2

Methods

The data were collected during the multi-phase Ohio Farm Family Health Survey (OFFHS) sponsored by the National Institute for Occupational Safety and Health (NIOSH), which was part of a larger nationwide effort focusing on agricultural safety and health. In Phase 1 of the study, 4860 questionnaires were sent out in June 1993 to cash-grain farmers in Ohio. The questionnaire (Appendix 1) was based upon several survey instruments including the National Center for Health Statistics' (NCHS) National Health Interview Survey and NCHS's Third National Health and Nutrition Examination Survey (NHANES III) (Crawford, 1995; Wilkins et al., 1997; Wilkins, 1997). Of the 4860 questionnaires sent out, 2571 questionnaires were filled out; 1793 of these were fully completed and considered "usable." Following Phase 1, eligible Phase 1 responders from 20 Central Ohio counties were asked to participate in Phase 2. Phase 2 consisted of in-home health screenings conducted by a specially-trained nurse who measured height and weight and conducted audiometry and spirometry according to standard procedures.

AUDIOMETRIC ASSESSMENT

The "exposure" variable of interest in this study was hearing threshold levels (HTLs) as determined by standard audiometric procedures. Audiometry was conducted with the Earscan Acoustic Impedence MP Audiometer (Model ES-TRAM, Microaudiometrics, South Daytona, FL) and TDH-39 headphones. Pure-tone air conduction thresholds were tested at the following frequencies: 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz, 4000 Hz, 6000 Hz, and 8000 Hz in each ear.

Audiometers were self-checked weekly with annual calibrations in accordance with ANSI Standard S3.6-1989. The audiometry testing took place in a quiet location in the home of the participant. Background noise was assessed during follow-up testing with the Quest Electronics Bio-Acoustic Simulator and Octave Monitor (Model BA-201-25, Oconomowoc, WI.) Using these threshold levels, calculations were made using formulas and methods to help determine the risk for injury based on these thresholds. In addition to ear-specific results, several other means were obtained as well, including the binaural average, the low frequency pure tone average (LTPA), and high frequency pure tone average (HPTA). The LPTA was defined as the mean of the HTLs obtained at 500 Hz, 1000 Hz, and 2000 Hz. The HPTA was defined as the mean of the HTLs obtained at 3000 Hz, 4000 Hz, and 6000 Hz. These definitions are based on NCHS's Third National Health and Nutrition Examination Survey (NHANES III) (Niskar et al., 1998). The poorer ear was also determined for each frequency.

CASE SELECTION

Case selection identification was based on the response to the following Phase 1 question: "During the past 12 months, have you, a family member, or any other person who regularly lives or works on this farm had an injury for which the injured person saw or talked to a medical doctor or assistant, or the injured person cut down on their usual activities for more than half a day?". Of all the male POs from the 20 county central Ohio area who participated in the Phase 2 data collection effort (n=510), 51 male POs answered yes to having an injury within the year preceding questionnaire administration.

CONTROL SELECTION

Controls were also male POs who participated in both Phase 1 and Phase 2 of the study, with the exception that they did not answer yes to the question given above. Using this

criterion, 459 male POs satisfied inclusion criterion as controls. Therefore, the control group was male PO farmers with no reported injury over the past year after questionnaire administration. No matching of cases to controls was performed.

INJURY CODING

The injuries were recorded and coded into the database using codes from the International Classification of Diseases-9 (ICD-9). The reported injuries were classified by the external cause of the injury (E-code) to describe the surroundings during the time of the injury and the nature of the injury (N-code) to describe the body part affected.

POTENTIAL CONFOUNDERS

A list of potential confounders were determined based on previous research (Crawford, 1995; Wilkins et al., 1997). Based on this list, means and standard deviations (SD), and crude ORs were estimated and tabulated for descriptive purposes and to assist in the identification of confounders. Confounding variables of interest fall into three categories: Sociodemographic, Behavioral, and Farm Characteristics. Sociodemographic variables included age, marital status, education, race and ethnicity. Behavioral variables included alcohol consumption in the past year, alcohol consumption in the PO's lifetime, any form of tobacco use in the past year, current smoker, and smoking in the PO's lifetime. Farm characteristic variables included total number of animals, annual gross sales, days spent on someone else's farm, and the percentage of time spent farming.

STATISTICAL ANALYSIS

For this study, SPSS 16.0 was used for statistical computing. The first part of the study was to select the case and control groups. Of all the male POs from the 20 county central Ohio area who participated in the Phase 2 data collection effort (n=510), 51 male POs answered yes to

having an injury within the year preceding questionnaire administration. Using this criterion, 459 male POs satisfied inclusion criterion as controls. Following this, SPSS was used to obtain statistical analysis on the two groups. Descriptive case-control comparisons were made by using logistic regression modeling, which produced the measure of association of interest, the odds ratio (OR). The first step in estimating the ORs was to generate tables for the various exposure variables and potential confounders by case-control status. "Exposures" in this context were the ear specific HTLs of the frequencies assessed by audiometry, the binaural averages, and the "poorer ear." The exposure variables were treated as continuous variables and then also categorized. For the categorized HTLs, a >25 dB fence was used. This is based on ASHA (1997), NIOSH, and OSHA's definition of "normal hearing." After calculating the crude ORs for the various frequency-specific HTLs, adjusted odds ratios (aORs) were estimated by adding age into the model. Other potential confounding variables were then added into the model in the way suggested by Hosmer & Lemeshow (2000). Using a p-value of 0.05 as the definition of statistically significant, ORs were calculated to determine the full model between HTLs and injury risk. Hosmer-Lemeshow goodness of fit test was used to determine the fit for the full model between HTLs and injury risk.

CHAPTER 3

Results

CASE AND CONTROLS

During Phase 2 of the OFFHS study, 1252 subjects participated in the home-health screenings and on-farm hazard assessments. Of these 1252 subjects, 520 (40.7%) subjects were principal operators (PO). Of these 520 POs, 10 were female and were excluded for the purposes of this study. The other 732 participants were female, children, or another male who was not the principal operator and therefore, were excluded from the data analysis. The 510 male POs were the participants that were used for the purpose of this study. Of these 510 male POs, 51 responded yes to the injury question, as previously described and therefore, made up the case group. The control group was comprised of the other male POs (n=510-51=459).

DESCRIPTION OF INJURIES

Table 1 presents the frequency distribution of the external causes of the injuries (E-codes). Of the 51 injuries reported, 16 were falls (31.4%), accounting for the majority of the injury causes, followed by 13 from overexertion or straining (25.5%), and 10 due to farm machinery (19.7%). Other external causes of injuries were 3 being struck by an animal (5.8%), 2 by tools or sharp objects (3.8%), and 2 by a motor vehicle accident (3.8%). Five of the 51 injuries were caused by being struck against or being caught by an object (2%), a foreign body in the eye (2%), fire (2%), an arthropod bite or sting (2%), or unspecified (2%).

Table 2 summarizes the frequency distribution for the nature of the injury (N-codes). Sprains and strains (n=17) contributed to the majority of the nature of the injuries (33.3%)

followed by 8 fractures (15.6%), and 6 open wounds (11.8%), superficial injuries and contusions (11.8%), and other and/or unspecified injuries or multiple sites (11.8%). Other types of injuries found among the cases were four dislocations (7.8%), two injuries due to foreign bodies in the eye (3.9%), one burn (2%), and one arthropod bite or sting (2%).

Table 1: Description of Cases by Number and Frequency of ICD-9 E-Codes (External Cause of Injury Codes)

E-Code	Description	Cases	
		n	%
E880.9-E888	Falls	16	31.4
E927	Overexertion or straining	13	25.5
E919.0	Farm machinery	10	19.7
E919.2-E920.9	Tools or other sharp objects	2	3.8
E906.8	Other specified injury by an animal	3	5.8
E812.0-E822.7	Motor vehicle mishap	2	3.8
E916-E918	Struck against or by or caught by object	1	2.0
E928.9	Unspecified	1	2.0
E914	Foreign body in eye	1	2.0
E893.2-E896	Fire	1	2.0
E905.3-E906.4	Arthropod bite or sting	1	2.0
Total		51	100.0

Table 2: Description of Cases by Number and Frequency of ICD-9 N-Codes (Nature of Injury)

N-Code	Description	Cases	
		n	%
N840.9-N849.8	Sprains and strains	17	33.3
N802.8-N829.0	Fractures	8	15.6
N873.4-N892.0	Open wounds	6	11.8
N959.1-N959.8	Other and unspecified, and multiple sites	6	11.8
N915.8-N924.9	Superficial injuries and contusions	6	11.8
N831.0-N839.8	Dislocations	4	7.8
N930.9	Foreign body in eye	2	3.9
N942.0-N946.0	Burns	1	2.0
N910.4-N913.4	Arthropod bites or stings	1	2.0
Total		51	100.0

BASIC AUDIOMETRIC FINDINGS

During the Phase-2 health assessment conducted in-home by a nurse, pure-tone audiometry and tympanometry was performed. Frequency and ear-specific results are summarized in Tables 3 and 4. In addition to ear-specific results, several different means were obtained. For both cases and controls, the audiometric HTLs tended to increase (worsen) from 500-6000 Hz (Tables 3 and 4). Overall, the control group had poorer HTLs than the case group at all frequencies. At all frequencies, the left ear was poorer than the right ear. The three-frequency low pure-tone average (LPTA) for the right ear was higher (poorer) for the cases (16.2 dB) compared to the control group (14.9 dB) (Table 3). The left ear LPTA displayed similar results; the cases' LPTA was 17.5 dB and the controls' was slightly better at 16.0 dB (Table 4). The right ear HPTA mean was 35.7 dB (SD=19.5) for the cases, which was slightly better than the mean for the controls (37.2 dB, SD=21.1) (Table 3). The left ear mean HPTA for the cases (40.2 dB, SD=18.1) was equal when compared to the control group (40.0 dB, SD=20.8) (Table

4). Clinically, there was no significant difference between the case and control groups for the HTLs.

Table 3: Right Ear Mean HTLs by Frequency and Case-Control Status

	Cases				Controls			
Frequency (Hz)	n=51	Median	Mean	SD	n=459	Median	Mean	SD
500		15	15.4	11.8		10	13.7	11.6
1000		10	14.5	12.5		10	13.0	13.0
2000		10	18.7	18.7		10	18.0	17.2
3000		20	28.7	23.2		25	31.0	23.0
4000		35	38.2	21.4		40	38.0	23.1
6000		40	42.8	23.9		40	45.0	23.0
8000		25	31.1	19.7		30	32.7	20.7
LPTA		12	16.2	12.6		12	14.9	12.1
HPTA		32	35.7	19.5		33	37.2	21.1

Figure 1: Right Ear Mean HTLs by Frequency and Case-Control Status

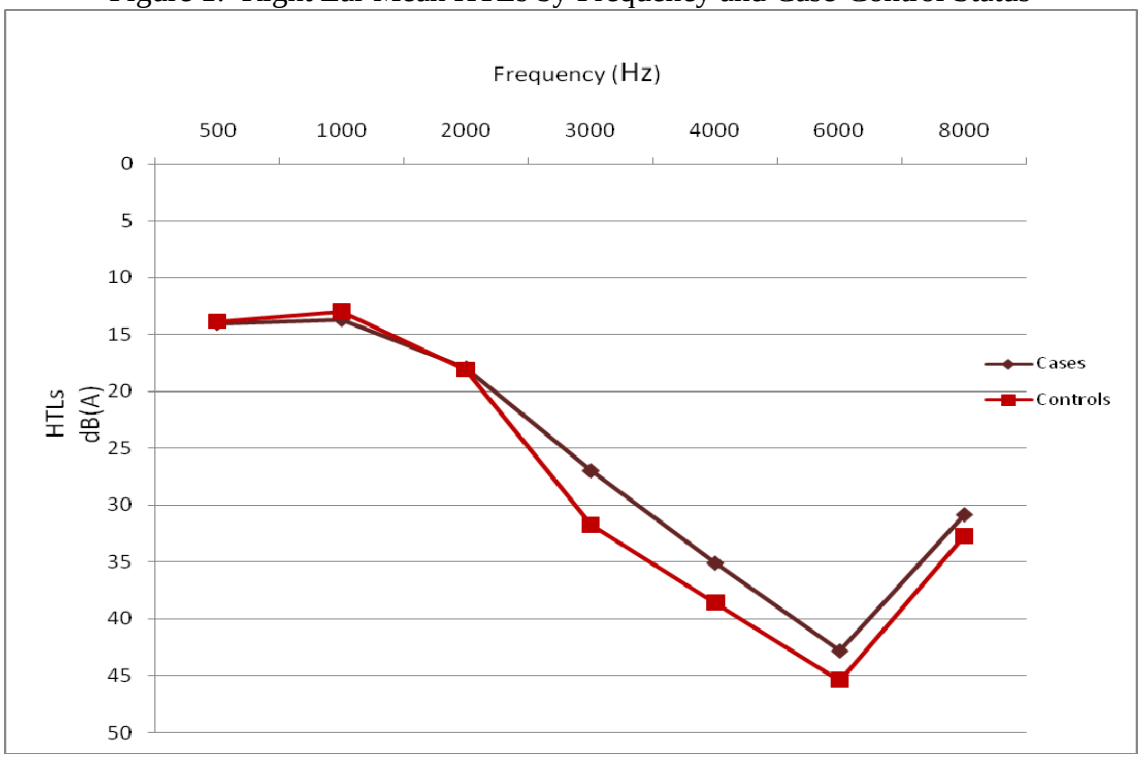


Table 4: Left Ear Mean HTLs by Frequency and Case-Control Status

	Cases				Controls			
Frequency (Hz)	n=51	Median	Mean	SD	n=459	Median	Mean	SD
500		15	16.5	12.0		10	13.9	10.9
1000		10	15.9	13.7		10	13.6	13.6
2000		15	20.1	18.7		15	21.1	19.8
3000		30	34.5	21.8		30	35.0	23.3
4000		45	39.8	23.5		40	39.9	22.3
6000		55	48.2	20.8		45	47.9	23.2
8000		30	33.3	21.0		30	33.5	21.1
LPTA		12	17.5	13.5		12	16.0	12.6
HPTA		44	40.2	18.1		40	40.0	20.8

Figure 2: Left Ear Mean HTLs by Frequency and Case-Control Status

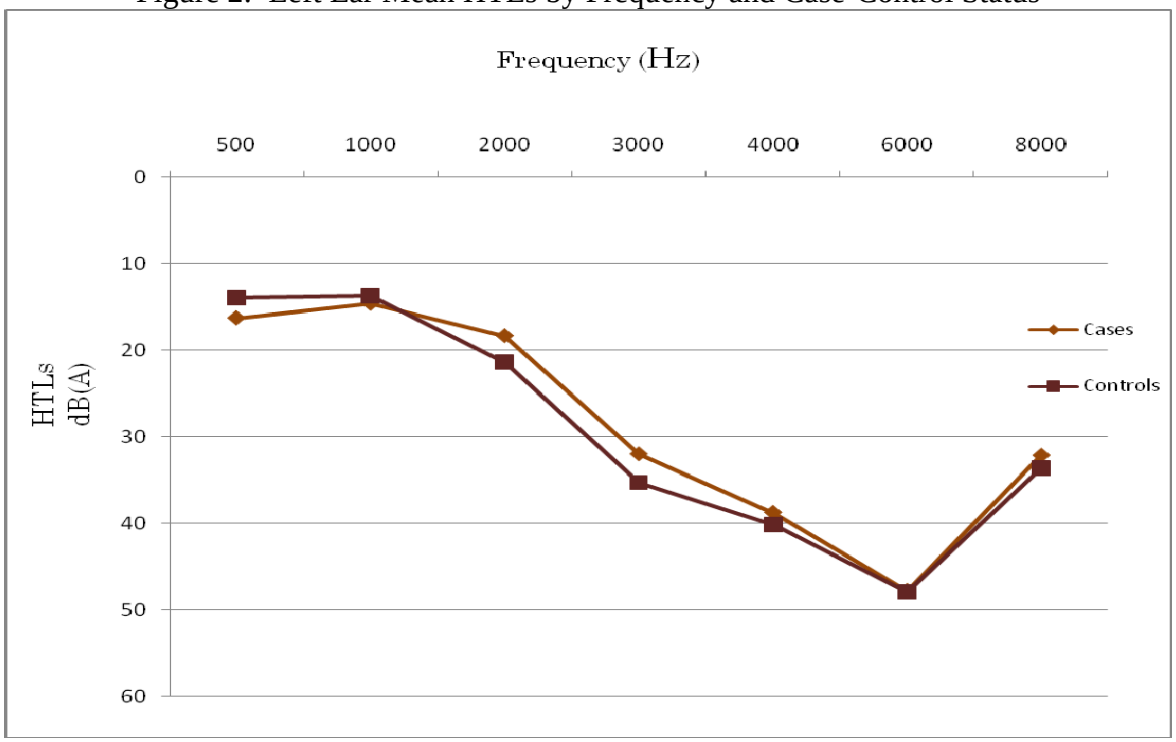
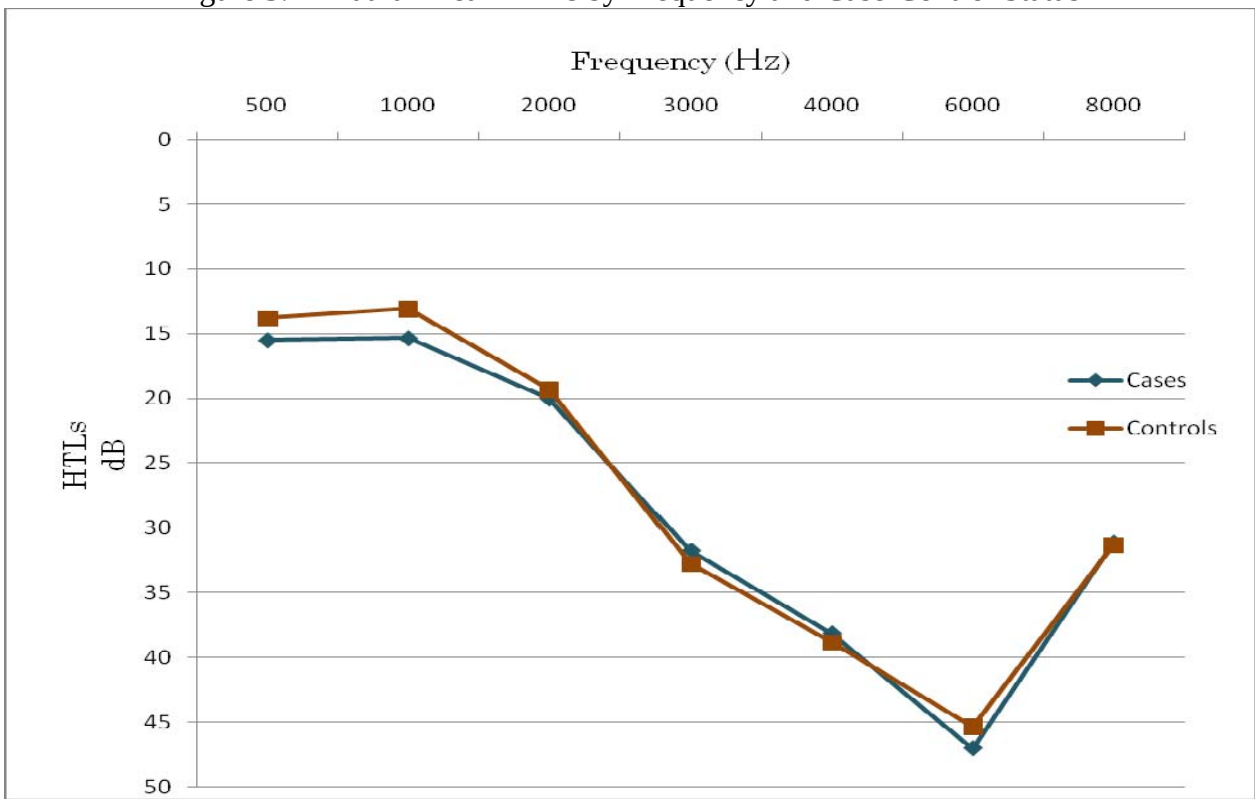


Table 5: Binaural Mean HTLs by Frequency and Case-Control Status

	Cases				Controls			
Frequency	n=51	Median	Mean	SD	n=459	Median	Mean	SD
500		15	15.5	9.1		12.5	13.8	10.1
1000		10	15.3	11.7		10	13.1	11.9
2000		15	20.0	17.2		15	19.3	17.7
3000		30	31.8	20.1		30	32.8	21.8
4000		41	38.2	20.8		40	38.9	21.4
6000		43	47.0	17.8		43	45.4	21.5
8000		28	31.1	17.8		28	31.3	18.7
LPTA		13	16.9	11.6		13	15.4	11.5
HPTA		39	37.7	17.0		36	37.8	20.1

Figure 3: Binaural Mean HTLs by Frequency and Case-Control Status



DEMOGRAPHIC DATA

As shown in Table 6, the mean age for the case group was found to be 51.0 years (SD=21) as compared to the control group of 54.0 years (SD=21). After conducting a Student's t-test, no significant difference was found between the case and control group with regards to age (p=0.64). In both groups, the majority of the subjects were married; 46 cases (92%) compared to 381 controls (83.6%). Two of the cases were divorced (3.9%) and one was never married (2%). One of the cases did not report marital status (2%). The control group consisted of 17 widowed (3.8%), 11 divorced (2.4%), 2 separated (0.4%), and 21 were never married (4.6%). Twenty-eight subjects in the control group did not report their marital status (6.1%) information (Table 7). Using X^2 p-values, no significant difference was found between the case and control groups with respect to marital status (p=0.33). The majority of the subjects in the case (45.1%) group were high school graduates with a slightly greater percentage of high school graduates in the control (52.2%) group. There were 13 cases that were college graduates (25.5%), 10 with some college education (19.6%), and five that did not graduate from high school (9.8%). Compared to the case group, 99 controls were college graduates (21.5%), 75 had some college education (16.3%), and 37 did not graduate from high school (8.0%) (Table 7). Using X^2 p-values, no significant difference was found between the case and control groups with respect to education (p=0.71).

Table 6: Case and Control Groups Age Distributions

	Age		
	Cases (n=51)	Controls (n=459)	p-value
Mean	51.0	54.0	0.64
Median	50.0	54.0	
SD	21	21	

	Cases			Controls		
Age Groups	n	%	Cum. Freq	Freq	%	Cum. Freq
25-29	2	3.9	3.9	3	0.7	0.7
30-34	3	5.9	9.8	22	4.8	5.5
35-39	5	9.8	19.6	44	9.6	15.1
40-44	5	9.8	29.4	54	11.8	26.9
45-49	8	15.7	45.1	42	9.2	36.1
50-54	4	7.8	52.9	68	14.8	50.9
55-59	8	15.7	68.6	59	12.9	63.8
60-64	7	13.7	82.3	57	12.4	76.2
65-69	3	5.9	88.2	47	10.2	86.4
70-74	2	3.9	92.1	29	6.3	92.7
75-79	2	3.9	96.0	15	3.3	96.0
80-84	0	0.0	96.0	6	1.3	97.3
85-89	0	0.0	96.0	5	1.1	98.4
Missing	2	3.9	99.9	8	1.7	100.0
Totals	51		100	459		100

Figure 4: Cumulative Age Frequencies by Case-Control Status

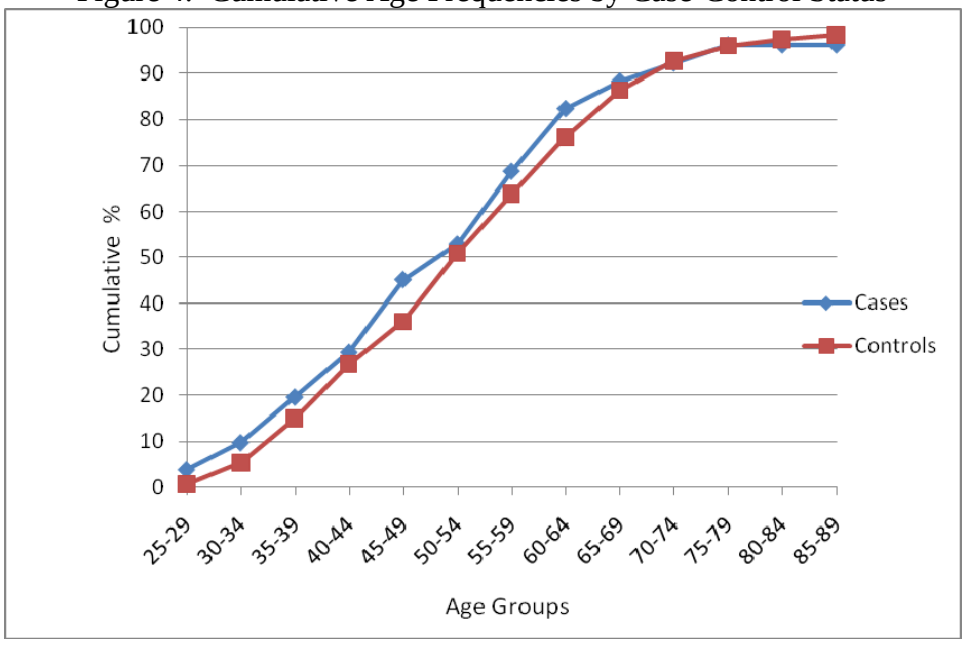


Table 7: Basic Demographic Information by Case-Control Status

	Q[1]. Number		Cases (n=51) n	Cases (n=51) %	Controls (n=459) n	Controls (n=459) %	X^2 p-value
Marital Status	14	Married	47	92.2	381	82.8	0.33
		Widowed	0	--	17	3.8	
		Divorced	2	3.9	11	2.4	
		Separated	0	--	2	0.4	
		Never married	1	2.0	21	4.6	
		Missing	1	2.0	28	6.1	
		Totals	51	100.0	459	100.0	
Education	17	Did not graduate from high school	5	9.8	37	8.0	0.71
		High school graduate	23	45.1	241	52.4	
		Some college	10	19.6	75	16.3	
		College graduate	13	25.5	99	21.5	
		Missing	0	0.0	8	1.7	
		Totals	51	100.0	459	100.0	

BEHAVIORAL CHARACTERISTICS

Behavioral characteristics for both the case and control groups are summarized in Table 8. Slightly more POs of the control group reported drinking alcohol in their lifetime (69.3%) as compared to the case group (64.7%) but no statistically significant differences were found between the case and control groups (p=0.44). Of the 459 controls, 178 (38.8%) reported drinking alcohol within the past year as compared to 16 of case group (31.4%). There was no significant difference found between the case and control group for the alcohol consumption within the past 12 months (p=0.29). A larger percentage (70.6%) of the control group had used some form of tobacco other than cigarettes as compared to the case group (25.1%) but this was not significantly different between the case and control groups (p=0.82). Many more of the cases (n=34, 66.7%) had smoked at least five packs of cigarettes in their lifetime compared to the control group (n=162, 35.3%). Both the case and control groups were asked about using

cigarettes within the past year. The vast majority for both the cases (n=47, 92.2%) and controls (n=407, 88.7%) had not used cigarettes in the past year. Other forms of tobacco and cigarette use were not statistically significant between the case and control groups (Table 8). Because the cases and controls are similar with respect to the variables considered in Table 8, these variables are probably not confounders.

Table 8: Behavioral Characteristics by Case-Control Status

			Cases		Controls		p-value
Variable	Q[2]. number		N=51	%	N=459	%	
Ever drank alcohol?	36	Yes	33	64.7	318	69.3	0.44
		No	18	35.3	136	29.6	
		Missing	0	0.0	5	1.2	
		Total	51	100.0	459	100.1	
Drank alcohol in past 12 months?	37	Yes	16	31.4	178	38.8	0.29
		No	35	68.6	278	60.6	
		Missing	0	0.0	3	0.6	
		Total	51	100.0	459	100.0	
Smoked at least 5 packs of cigarettes in your lifetime?	31	Yes	34	66.7	162	35.3	0.76
		No	17	33.3	295	64.3	
		Missing	0	0.0	2	0.4	
		Total	51	100.0	459	100.0	
Currently smoke cigarettes?	32	Yes	4	7.8	49	10.7	0.52
		No	47	92.2	407	88.7	
		Missing	0	0.0	3.0	0.7	
		Total	51	100.0	459	100.1	
Use any type of tobacco other than cigarettes?	35	Yes	14	27.5	118	25.1	0.82
		No	36	70.6	327	71.2	
		Missing	1	2.0	14	3.1	
		Total	51	100.1	459	99.4	

[1] Based on questionnaire questions from Phase 1 (see appendix 1)
[2] Based on questionnaire questions from Phase 1 (see appendix 1)

SELECTED FARM/FARMER CHARACTERISTICS

Certain characteristics of the farm and the farmer may contribute to injury risk. Information about the percentage of time farming, total number of animals on the farm, total annual sales, and days spent on someone else's farm was collected. Table 9 summarizes the results of comparing cases and controls with respect to selected farm/farmer characteristics. The majority of the case group (31.4%) had total annual sales of $10,000-$39,999, which is similar to that of the control group (25.5%). No significant difference using the X^2 test was found between the case and control groups (p=0.27). The average number of total animals within the case group was 140.8 (SD=310.2), which is very similar to the control group (n=145.0, SD=440.5). Using the Student t-test, no significant difference was found between the case and control groups (p=0.95). The case group spent more days on someone else's farm (n=48.7, SD=77.4), as compared to the control group (n=28.9, SD=53.6), which was not significantly different (p=0.33). The percentage of time spent farming was also assessed. In both groups the majority of POs farmed between 80% and 100% of the time. There was no significant difference between case and control group (p=0.36). Because the cases and controls are similar with respect to the variables considered in Table 9, these variables are probably not confounders.

Table 9: Selected Farm/Farmer Characteristics by Case-Control Status

		Cases		Controls		
Variable	Q[3]. Number	n=51	%	n=459	%	p-value
Total sales value in the past 12 months	7					0.27
$0-9999		8	15.7	112	24.4	
$10,000-39,9999		16	31.4	117	25.5	
$40,000-99,9999		8	15.7	87	19.0	
$100,000-249,9999		13	25.5	81	17.7	
$250,000+		5	9.8	43	9.4	
Missing		1	2.0	19	4.1	
		51	100.1	459	100.1	
Total animals	6	Mean	140.8	145.0		0.95
		SD	310.2	440.5		
Days spent working on someone else's farm	23	Mean	48.7	28.9		0.33
		SD	77.4	53.6		
% of time farming	19					0.36
0		0	0.0	6	0.6	
10		6	11.8	58	12.3	
20		2	3.9	43	9.4	
30		6	11.8	54	11.8	
40		4	7.8	31	6.8	
50		1	2.0	41	8.9	
60		1	2.0	18	3.9	
70		4	7.8	34	7.4	
80		9	17.6	52	11.3	
90		8	15.7	75	16.3	
100		9	17.6	88	19.2	
Missing		1	2.0	45	9.8	
Total		51	100.0	459	99.4	

[3] Based on questionnaire questions from Phase 1 (see appendix 1)

LOGISTIC REGRESSION RESULTS FOR CONTINUOUS VARIABLES

Table 10 summarizes the results of assessing the potential association between the odds of unintentional injury and the frequency-specific HTLs treated as a continuous variable. Based on the p-values and 95% CIs, no crude odds ratios were found to be statistically significant in conventional terms, although the left 500 Hz odds ratio approached significance (p=0.08, 95% CI=1.00-1.05). This may have been due to a chance finding.

Table 10: Logistic Regression Results Treating the HTLs as Continuous Variables

Ear	Frequency (Hz)	cOR	p-value	95% CI
Rt	500	1.00	0.82	0.98-1.03
Rt	1000	1.01	0.31	0.99-1.03
Rt	2000	1.01	0.53	0.99-1.02
Rt	3000	1.00	0.51	0.98-1.01
Rt	4000	1.00	0.72	0.99-1.01
Rt	6000	1.00	0.91	0.99-1.01
Rt	8000	1.00	0.73	0.98-1.01
Lt	500	1.02	0.08	1.00-1.05
Lt	1000	1.01	0.25	0.99-1.03
Lt	2000	1.00	0.74	0.99-1.02
Lt	3000	1.01	0.98	0.99-1.01
Lt	4000	1.00	0.90	0.99-1.01
Lt	6000	1.00	0.55	0.99-1.02
Lt	8000	1.00	0.80	0.99-1.01
Lt	Poorer Ear	1.01	0.56	0.99-1.02
Bi	500	1.02	0.26	0.99-1.04
Bi	1000	1.02	0.20	0.99-1.04
Bi	2000	1.00	0.79	0.99-1.02
Bi	3000	1.00	0.75	0.98-1.01
Bi	4000	1.00	0.82	0.99-1.01
Bi	6000	1.00	0.61	0.99-1.02
Bi	8000	1.00	0.94	0.98-1.02
Rt	HPTA[4]	1.00	0.59	0.98-1.02
Rt	LPTA[5]	1.02	0.15	0.99-1.05
Lt	HPTA	1.00	0.95	0.99-1.02
Lt	LPTA	1.01	0.36	0.99-1.03
Bi	LPTA	1.01	0.35	0.99-1.04
Bi	HPTA	1.00	0.97	0.99-1.02

[4] LPTA=Average of 500 Hz, 1000 Hz, and 2000 Hz
[5] HPTA=Average of 3000 Hz, 4000Hz, and 6000 Hz

Because hearing acuity is strongly associated with age, all of the injury-HTL ORs were age-adjusted by adding age to the one-variable models (see Table 11). The two-variable models resulted in two age-adjusted ORs that were found to be statistically significant (OR >1) (Lt1000 and Bi 2000). Left 2000 Hz approached significance (p=0.09, 95% CI=1.00-1.04). In general, age-adjustment slightly increased the magnitude of the ORs, which is not surprising given the fact that cases were younger on average than controls (51.0 years versus 54.0 years, respectively, as shown in Table 3). Following the construction of two-variable models, three-variable models were constructed to help guide the multivariable model for logistic regression (Appendix 2). Variables affecting the ORs by +/- 10% for continuous variables were considered for the multivariable model.

MULITVARIABLE LOGISTIC REGRESSION TREATING HTLs AS CONTINUOUS HTLs

The multivariable full model consisted of those potential confounders that were controlled for in the three variable model and statistically changed the OR by =/-10% for the exposure variable. The final model consisted of the following variables: Education (Q.17), Age, Past Cigarette Use (Q.31), Have Ever Drank Alcohol (Q.36), Total Annual Sales Value (Q.7), and the Percentage of Time Spent Farming (Q.19). The model building approach was adapted from Hosmer and Lemeshow (2000). Regression diagnostics were assessed with the Hosmer-Lemeshow goodness-of-fit test. Based on the p-value and 95% CI, four final ORs were found to be statistically significant (Lt 500, Lt 1000, Lt 6000, Bi 1000) as seen in Table 12. In addition, several “exposure” variables approached significance (Rt 1000, Poorer ear, Bi 6000, Lt LPTA). In general, it was found that as hearing acuity became poorer, the risk for injury increased. In addition to these findings, the right 1000 Hz, the poorer ear (left), binaural 6000 Hz, binaural LPTA, and the left ear LTPA approached significance (Table 12). This model for all three

exposure variables were considered a good fit (p>0.05) based on Hosmer and Lemeshow (2000). For every decibel that a HTL worsens, injury risk increases.

Table 11: Two Variable Logistic Regression Results Treating the HTL as Continuous Variables and Controlling for Age

				For aORs	
Ear	Frequency	cOR	aOR	p-value	95% CI
Rt	500	1.00	0.99	0.63	0.38-1.81
Rt	1000	1.01	1.02	0.59	0.98-1.03
Rt	2000	1.01	1.01	0.11	1.00-1.04
Rt	3000	1.00	1.00	0.15	1.00-1.03
Rt	4000	1.00	1.00	0.89	0.98-1.01
Rt	6000	1.00	1.01	0.80	0.99-1.02
Rt	8000	1.00	1.00	0.42	0.99-1.02
Lt	500	1.02	1.03	0.92	0.98-1.02
Lt	1000	1.01	1.02	0.04	1.00-1.05
Lt	2000	1.00	1.00	0.09	1.00-1.04
Lt	3000	1.01	1.01	0.74	0.99-1.02
Lt	4000	1.00	1.01	0.44	0.99-1.02
Lt	6000	1.00	1.01	0.52	0.99-1.02
Lt	8000	1.00	1.01	0.90	1.00-1.03
Lt	Poorer Ear	1.01	1.02	0.53	0.99-1.02
Bi	500	1.02	1.02	0.12	1.00-1.04
Bi	1000	1.02	1.03	0.13	0.99-1.05
Bi	2000	1.00	1.01	0.05	1.00-1.05
Bi	3000	1.00	1.00	0.33	0.99-1.03
Bi	4000	1.00	1.01	0.68	0.99-1.02
Bi	6000	1.00	1.02	0.58	0.99-1.02
Bi	8000	1.00	1.00	0.11	1.00-1.03
Rt	HPTA	1.00	1.00	0.95	0.98-1.02
Rt	LPTA	1.02	1.02	0.81	0.98-1.02
Lt	HPTA	1.00	1.01	0.15	0.99-1.05
Lt	LPTA	1.01	1.02	0.27	0.99-1.03
Bi	LPTA	1.01	0.98	0.10	0.95-1.00
Bi	HPTA	1.00	1.01	0.39	0.99-1.03

Table 12: Multivariable Logistic Regression Results Treating the HTLs as Continuous Variables

Ear	Freq	cOR	aOR[6]	p-value	95% CI
Rt	500	1.00	1.00	0.54	0.98-1.04
Rt	1000	1.01	1.02	0.07	1.00-1.05
Rt	2000	1.01	1.02	0.13	1.00-1.04
Rt	3000	1.00	1.00	0.89	0.99-1.02
Rt	4000	1.00	1.01	0.57	0.99-1.02
Rt	6000	1.00	1.01	0.35	0.99-1.03
Rt	8000	1.00	1.00	0.99	0.98-1.02
Lt	500	1.02	1.03	0.03	1.00-1.05
Lt	1000	1.01	1.02	0.04	1.00-1.04
Lt	2000	1.00	1.01	0.53	0.99-1.02
Lt	3000	1.01	1.01	0.29	0.99-1.03
Lt	4000	1.00	1.01	0.24	0.99-1.03
Lt	6000	1.00	1.02	0.05	1.00-1.03
Lt	8000	1.00	1.01	0.62	0.99-1.02
Lt	Poorer Ear	1.01	1.02	0.06	1.00-1.05
Bi	500	1.02	1.02	0.11	1.00-1.06
Bi	1000	1.02	1.03	0.03	1.00-1.06
Bi	2000	1.00	1.01	0.23	0.99-1.03
Bi	3000	1.00	1.01	0.46	0.99-1.03
Bi	4000	1.00	1.01	0.30	0.99-1.02
Bi	6000	1.00	1.02	0.07	1.00-1.04
Bi	8000	1.00	1.00	0.97	0.98-1.02
Rt	LPTA	1.00	1.02	0.11	1.00-1.05
Rt	HPTA	1.02	1.01	0.60	0.99-1.03
Lt	LPTA	1.00	1.02	0.07	1.00-1.05
Lt	HPTA	1.01	1.01	0.13	1.00-1.03
Bi	LPTA	1.01	1.03	0.06	1.00-1.06
Bi	HPTA	1.00	1.01	0.19	0.99-1.04

LOGISTIC REGRESSION RESULTS TREATING HTLs AS A CATEGORICAL VARIABLE

After treating the HTL as a continuous variable, a >25dB fence was used to categorize cases and controls as “exposed” and “not exposed”. Table 13 summarizes the number of cases

and controls classified as “exposed” and “not exposed, ” along with the crude odds ratios. Based on the p-value and 95% CI value, no crude odds ratios were found to be statistically significant in conventional terms, although four variables (Lt 6000 Hz, Bi 1000 Hz, Bi 6000 Hz, Lt LTPA, and Rt HPTA) approached significance as shown in Table 13.

After controlling for age with the >25 dB fence several age-adjusted ORs were found to be statistically significant at the $p<0.05$ level (Lt 6000 Hz, Bi 1000 Hz, Bi 6000 Hz, and Rt HPTA) (Table 14). It was also found that the right 6000 Hz adjusted odds ratio of 2.15 ($p=0.06$, 95% CI=0.97-4.75) and the binaural 500 Hz aOR of 2.14 ($p=0.07$, 95% CI=0.95-4.80) approached statistical significance. In general, age-adjustment increased the magnitude of the ORs. Following the two-variable model, three-variable models were constructed to help guide the determination of the multivariable model (Appendix 2). Variables affecting the cORs by +/- 10% for continuous variables were considered for the multivariable model.

MULTIVARIABLE LOGISTIC REGRESSION MODELS TREATING HTLs AS A CATEGORICAL VARIABLE

The multivariable full model consisted of those potential confounders that were controlled for in the three variable model and statistically changed the OR by =/-10% for the exposure variable (see Table 15). The final model consisted of the following variables: Education (Q.17), Age, Past Cigarette Use (Q.31), Have Ever Drank Alcohol (Q.36), Total Annual Sales Value (Q.7), and the Percentage of Time Spent Farming (Q.19). The model building process was adapted from Hosmer and Lemeshow (2000). Regression diagnostics were assessed with the Hosmer-Lemeshow goodness-of-fit test. Based on the p-value and 95% CI, six final ORs were found to be statistically significant (Rt 6000 Hz, Bi 500 Hz, Bi 1000 Hz, Bi 6000

[6] Adjusted for Age, Education, Past Cigarette Use, Have Ever Drank Alcohol, Total Annual Sales Value, and Percentage of Time Spent Farming

Hz, Lt 6000 Hz, and Lt HPTA). In addition, several "exposure" variables approached significance (Lt 3000 Hz, Poorer ear, and Bi 3000 Hz). As shown in Table 15, the most notable result was that thresholds poorer than 25 dB for 6000 Hz in the left ear resulted in an aOR of 3.35 (p=0.01, 95% CI=1.29-8.73). Other significant findings for those with >25 dB HTLs were the right and left 6000 Hz, left HPTA, binaural 500 Hz, binaural 1000Hz, and binaural 6000 Hz. Three other findings approached significance (Lt 3000 Hz, poorer ear (left), and Bi 3000 Hz). In general, controlling for potential confounders increased the magnitude of the ORs (Table15). Using the Hosmer and Lemeshow (2000) formula as a guide, goodness of fit was assessed. This model resulted in significance values of $p>0.05$, which is a good model fit according to Hosmer and Lemeshow (2000).

Table 13: Logistic Regression Results Treating HTLs as Categorical Variables

Ear	Freq.	No. Cases >25dB(A)	No. Controls >25dB(A)	cOR	p-value	95% CI
Rt	500	3	57	0.44	0.17	0.13-1.46
Rt	1000	9	60	1.42	0.37	0.66-3.06
Rt	2000	12	109	0.98	0.95	0.50-1.94
Rt	3000	20	219	0.69	0.22	0.38-1.25
Rt	4000	32	281	1.04	0.91	0.57-1.89
Rt	6000	39	310	1.60	0.22	0.76-3.25
Rt	8000	21	199	0.84	0.60	0.45-1.58
Lt	500	7	44	1.50	0.35	0.64-3.52
Lt	1000	8	52	1.46	0.36	0.65-3.27
Lt	2000	14	129	0.96	0.91	0.50-1.84
Lt	3000	30	245	1.30	0.41	0.71-2.33
Lt	4000	32	297	1.93	0.81	0.51-1.70
Lt	6000	42	337	2.12	0.09	0.88-5.13
Lt	8000	26	207	1.21	0.56	0.64-2.31
Bi	500	9	47	1.87	0.11	0.86-4.08
Bi	1000	11	58	1.89	0.08	0.92-3.89
Bi	2000	14	119	1.07	0.84	0.56-2.05
Bi	3000	29	234	1.28	0.41	0.71-2.31
Bi	4000	33	299	0.97	0.92	0.52-1.79
Bi	6000	42	327	2.03	0.11	0.84-4.93
Bi	8000	22	186	1.08	0.81	0.56-2.09
Lt	Poorer Ear	32	260	1.29	0.40	0.71-2.34
Rt	LPTA[7]	10	70	1.35	0.43	0.64-2.81
Rt	HPTA[8]	32	274	1.10	0.09	0.59-2.04
Lt	LPTA	9	87	0.91	0.06	0.43-1.94
Lt	HPTA	35	285	1.43	0.29	0.73-2.78
Bi	LPTA	10	77	1.20	0.63	0.58-2.49
Bi	HPTA	33	264	1.31	0.41	0.69-2.49

[7] LPTA=500 Hz, 1000 Hz, and 2000 Hz
[8] HPTA=3000 Hz, 4000 Hz, and 6000 Hz

Table 14: Logistic Regression Results Treating the HTLs as Categorical Variables and Controlling for Age

Ear	Freq.	cOR	aOR	p-value	95% CI
Rt	500	0.44	0.48	0.23	0.97-1.02
Rt	1000	1.42	0.98	0.16	0.96-1.01
Rt	2000	0.98	1.22	0.61	0.56-2.69
Rt	3000	0.69	0.74	0.38	0.38-1.46
Rt	4000	1.04	1.28	0.49	0.64-2.55
Rt	6000	1.60	2.15	0.06	0.97-4.75
Rt	8000	0.84	0.88	0.71	0.44-1.76
Lt	500	1.50	1.66	0.26	0.69-4.00
Lt	1000	1.46	1.72	0.21	0.73-4.01
Lt	2000	0.96	1.11	0.78	0.55-2.24
Lt	3000	1.30	1.73	0.11	0.88-3.43
Lt	4000	1.93	1.12	0.74	0.56-2.25
Lt	6000	2.12	3.06	0.02	1.20-7.82
Lt	8000	1.21	1.43	0.33	0.69-2.96
Bi	500	1.87	2.14	0.07	0.95-4.80
Bi	1000	1.89	2.55	0.02	1.14-5.70
Bi	2000	1.07	1.33	0.45	0.63-2.79
Bi	3000	1.28	1.80	0.10	0.89-3.62
Bi	4000	0.97	1.20	0.62	0.59-2.46
Bi	6000	2.03	2.85	0.03	1.11-7.32
Bi	8000	1.08	1.16	0.70	0.55-2.47
Lt	Poorer Ear	1.29	1.75	0.11	0.95-1.00
Rt	LPTA	1.35	1.77	0.17	0.78-4.04
Rt	HPTA	1.10	1.46	0.04	0.71-2.99
Lt	LPTA	0.91	1.04	0.93	0.46-2.34
Lt	HPTA	1.10	1.98	0.45	0.96-4.08
Bi	LPTA	1.20	1.55	0.30	0.68-3.53
Bi	HPTA	1.31	1.86	0.10	0.88-3.91

Table 15: Multivariable Logistic Regression Results Treating the HTLs as Categorical Variables

Ear	Freq	cOR	aOR[9]	p-value	95% CI
Rt	500	0.44	0.52	0.30	0.15-1.76
Rt	1000	1.42	2.06	0.10	0.88-4.85
Rt	2000	0.98	1.38	0.44	0.62-3.08
Rt	3000	0.69	0.75	0.43	0.37-1.53
Rt	4000	1.04	1.47	0.30	0.71-3.06
Rt	6000	1.60	2.23	0.05	0.99-5.03
Rt	8000	0.84	0.93	0.85	0.44-1.96
Lt	500	1.50	1.84	0.18	0.75-4.49
Lt	1000	1.46	2.07	0.10	0.87-4.93
Lt	2000	0.96	1.24	0.55	0.60-2.56
Lt	3000	1.30	1.96	0.06	0.96-3.98
Lt	4000	1.93	1.33	0.44	0.64-2.76
Lt	6000	2.12	3.35	0.01	1.29-8.73
Lt	8000	1.21	1.49	0.31	0.69-3.22
Lt	Poorer Ear	1.87	2.01	0.06	0.97-4.15
Bi	500	1.89	2.40	0.04	1.05-5.48
Bi	1000	1.07	3.11	0.01	1.36-7.12
Bi	2000	1.28	1.51	0.30	0.70-3.26
Bi	3000	0.97	2.01	0.06	0.97-4.16
Bi	4000	2.03	1.43	0.35	0.67-3.06
Bi	6000	1.08	3.18	0.02	1.21-8.36
Bi	8000	1.29	1.23	0.61	0.56-2.72
Rt	LPTA	1.35	2.01	0.10	0.87-4.68
Rt	HPTA	1.10	1.50	0.30	0.70-3.20
Lt	LPTA	0.91	1.16	0.73	0.51-2.64
Lt	HPTA	1.43	2.11	0.05	1.00-4.46
Bi	LPTA	1.20	1.85	0.15	0.79-4.31
Bi	HPTA	1.31	1.93	0.10	0.89-4.18

[9] Adjusted for Age, Education, Past Cigarette Use, Have Ever Drank Alcohol, Total Annual Sales Value, & Percentage of Time Spent Farming

CHAPTER 4

Discussion and Conclusion

INJURY ASSESSMENT

Male farmers in 20 central Ohio counties who completed both the Phase 1 questionnaire and audiometry in Phase 2 comprised the sample for this study as part of the larger OFFHS study. Of these 510 male farmers, 51 reported an injury within the year preceding the questionnaire administration. This injury rate of 10.0% is consistent with previous studies examining the injuries among farming populations. For example, Browning, et al. (1998) who found a prevalence of injury among farmers to be 9.0 per 100 people. Lewis et al. (2001) determined a cumulative incidence of injury among Iowa farmers to be 10.5%. Falls were the primary external cause for the injuries (n=16, 31.4%) as shown in Table 1. Sprains and strains comprised the majority of the type of injuries that were reported by the case group (n=17, 33.3%, see Table 2).

AUDIOMETRIC FINDINGS

Upon initial inspection, the audiometric thresholds for the case and control groups were very similar. Graphing the average threshold levels by frequency revealed a noise-notch pattern with the notch present at 6000 Hz in the left ear, right ear, and the binaural average (see Figures 1-3). Though not clinically significant, the control group had poorer hearing acuity than the case group, it is important to note that the control group was overall older than the case group, which likely accounts for the poorer threshold levels among controls. In both groups, the left ear mean HTL was poorer than the right ear and also had poorer mean HTLs at every frequency compared

to the right ear. There are many reasons that may account for these poorer thresholds in the left ear. One of these reasons could be due to open cab tractors, as they are much louder than closed cab tractors. As farmers are driving tractors and look over their right shoulder, the left ear is closer to the tractor engine noise, resulting at an increased risk for excessive noise exposure and subsequent hearing loss. Another reason that could contribute to the poorer left ear findings could be certain recreational activities. A right-handed gun shooter is at risk for a noise-induced hearing loss in the left ear, which may contribute to the poorer thresholds in the left ear as well.

HTLs and INJURY RISK

The most notable result of the multivariable regression modeling was the high-frequency pure-tone average (HPTA) in the left ear using a fence of >25 dB, which resulted in an adjusted odds ratio of 3.35 (95% CI=1.01-4.86) for injury risk. The final model consisted of age, education, ever smoking cigarettes, ever drinking alcohol, total annual sales value, and the percentage of time spent farming. It is important to note that age was controlled for because increased age is strongly associated with hearing loss and younger age is associated with injury risk (Crawford, 1995). Several significant results were found for both continuous variables and categorizing the variables into “exposed” and “not exposed”. Arguably, the most notable results were for the categorical variables of “exposed” and “not exposed” using a >25 dB fence. The most marked finding was that for 6000 Hz in either ear or the binaural average of the two ears at 6000 Hz, resulted in an increased risk for injury for those subjects with HTLs >25 dB (see Table 15).

These results are hard to compare to other studies, as other studies investigating injury risk and hearing loss either relied on self-report of hearing loss or used specific and limited audiometric data. No known previous studies have examined only HTLs as the exposure

variable. The increased risk for injury due to hearing loss is consistent with previous studies examining hearing loss (Browning et al., 1998; Crawford et al., 1998; Lewis et al., 1998; Hwang et al., 2001; Sprince et al., 2003; Choi et al., 2005; Sprince et al., 2007).

POSSIBLE MECHANISMS

There are several theories as to what the mechanism may be in explaining the relationship between poorer hearing acuity and injury risk. One of these reasons could be that poorer hearing acuity contributes to communication difficulties, especially in the presence of competing noise, or at distances. Because farm machinery and some agriculture-related farm tasks are noisy, it may be difficult to communicate with coworkers. Moll van Charante and Mulder (1990) found noise levels >82 dB(A) to significantly increase the risk for injury for shipyard workers with both normal hearing acuity and poor hearing acuity. Therefore, these subjects may miss critical information needed to make decisions to avoid injury. Another possible theory could be that important environmental sound cues are missed by farmers with poorer hearing acuity. These environmental cues may be important in recognizing and avoiding danger and being able to react to prevent an unintentional injury from occurring. It is interesting to note that 6000 Hz was the poorer HTL for both ears and also resulted in the greatest risk for injury. There may be some underlying cues listeners use at 6000 Hz that are missed with poorer hearing acuity at this frequency.

CONCLUSION

There has been previous research examining risk factors associated with injury in which hearing loss was found to be a significant factor, but there are few studies examining audiometric hearing thresholds levels (HTLs) and injury risk. Because of this, the results of this study may further help audiologists, public health workers, and others interested in hearing loss and injury

risk to reduce the incidence of injuries among the agricultural community. Because OSHA has not created agricultural safety laws for farms with fewer than 11 workers, it is vital that education for hearing loss prevention be targeted towards this population. The noise-induced hearing threshold pattern seen in the farmers, further emphasizes importance of hearing loss prevention programs for farming populations. In this study, the hearing threshold level (HTL) pattern also reveals the importance for audiologists to routinely test 6000 Hz during audiometric testing especially when the patient has recreational or occupational noise exposure history.

As health care professionals, audiologists should always be thinking of ways to help patients communicate more effectively as a result of their hearing loss. There are times that other implications of a hearing loss experienced by an individual in addition to their communication needs are forgotten. As a result of a hearing loss, non-fatal and even fatal injuries may result. By providing farmers with a tangible possible consequence of hearing loss, it may help to more effectively improve hearing conservation programs. It is important for audiologists to work with other professionals for an increased awareness of hearing conservation and hearing loss prevention. Having audiologists collaborate with other professionals, new and creative ideas can be found to more effectively teach agricultural communities and help try to reduce hearing loss among this population, therefore, reducing the incidence of injuries among the agricultural community.

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APPENDIX 1

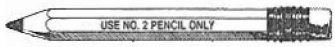
THE OHIO FARM FAMILY HEALTH STUDY

Form Approved
OMB NO. 0920-0313
Exp. Date 2-29-9

PLEASE READ THIS FIRST

PAGES 1-13 (SECTIONS 1-9) ARE TO BE FILLED OUT BY THE FARM'S PRINCIPAL OPERATOR (THE SENIOR PARTNER OR THE FARMER WHO IS IN CHARGE OF THE DAY-TO-DAY FARMING DECISIONS). PAGES 14-16 (SECTIONS 10-14) ARE TO BE FILLED OUT BY THE OPERATOR'S SPOUSE OR BY THE PERSON LIVING IN THE HOUSEHOLD CLOSEST IN AGE TO THE PRINCIPAL OPERATOR. ALL INFORMATION YOU GIVE WILL BE TREATED IN A CONFIDENTIAL MANNER. PLEASE CAREFULLY READ THE MARKING DIRECTIONS BELOW BEFORE PROCEEDING.

MARKING DIRECTIONS



- Go from **QUESTION** to **QUESTION** in numerical order unless instructed otherwise. Please follow the directional arrows.
- Do not make stray marks on this form. Fill ovals completely.
- Erase cleanly entries you wish to change.
- Correct mark ●
- Incorrect marks ✓ ⊗ ◔ ◒ NO
- When your answer to a question is "zero" or "none," don't leave the question blank - be sure to indicate "zero."
  When a vertical grid is provided for a numerical answer, write numbers in boxes provided, and then blacken appropriate oval directly below each number.
- When a horizontal grid is provided for a numerical answer, blacken ovals so they add up to the right number.
- When a space or box is provided, please write in the requested information.
  When completed, return in the 9x12 postage paid envelope provided.
- PLEASE DO NOT FOLD THE QUESTIONNAIRE BOOKLET.

EXAMPLE:
Date of birth = "December 18, 1949"

MO		DAY		YR	
1	2	1	8	4	9

EXAMPLE:
Hours worked per week = "54"

10 20 30 40 ● 60 70 80 90
1 2 3 (5) (6) (7) (8) (9)

EXAMPLE:
Write in last off-farm job you had → WRITE IN: Painter

SECTION 1 Background Information on the Farm and the Principal Operator

A. Farm Characteristics

1a. Name and address label

1b. Please indicate the Ohio county where the bulk of the farm is located — WRITE IN COUNTY NAME

SELECT COUNTY CODE FROM LIST A. LIST A AND ALL OTHER LISTS REFERRED TO ARE ON ENCLOSED YELLOW SHEET

1c. Please correct any name and address information in the label above by writing in the correct information below:

NAME OF FARM — WRITE IN NAME OF FARM

LOCATION OF FARM — WRITE IN STREET/ROAD | CITY OR TOWN

NAME OF PRINCIPAL OPERATOR — FIRST NAME | MI | LAST NAME

LIST A CODE

1d. Please give your telephone number. We may need to contact you later. — AREA CODE | NUMBER

2. Does the Principal Operator live on this farm? ○ Yes ○ No

PLEASE DO NOT WRITE IN THIS AREA

011309

3a. What is the total number of people that have assisted in the operation of this farm in the past 12 months? → NUMBER

3b. How many of these were seasonal or migrant workers? → NUMBER

4. As of today's date, please give the number of acres worked as part of the normal commercial operations of this farm:

	NUMBER OF ACRES														
	0	1 - 9	10 - 49	50 - 69	70 - 99	100 - 139	140 - 179	180 - 219	220 - 259	260 - 379	380 - 499	500 - 749	750 - 999	1,000 - 1,999	2,000 or more
Cropland in use	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Idle cropland	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Pasture land and rangeland	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Land used for animal confine-ment and feedlots	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
All other land	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

5. For the most recent growing season, please give the number of acres of the following crops planted, grown, or present on this farm as part of its normal commercial operations:

	NUMBER OF ACRES											
	0	1 - 14	15 - 24	25 - 49	50 - 99	100 - 249	250 - 499	500 - 999	1,000 - 1,999	2,000 - 2,999	3,000 - 3,999	4,000 or more
Corn for grain or seed	○	○	○	○	○	○	○	○	○	○	○	○
Corn for silage or green chop	○	○	○	○	○	○	○	○	○	○	○	○
Soybeans for beans	○	○	○	○	○	○	○	○	○	○	○	○
Wheat for grain	○	○	○	○	○	○	○	○	○	○	○	○
Oats for grain	○	○	○	○	○	○	○	○	○	○	○	○
All hay crops	○	○	○	○	○	○	○	○	○	○	○	○
Alfalfa hay only	○	○	○	○	○	○	○	○	○	○	○	○
All other crops	○	○	○	○	○	○	○	○	○	○	○	○
All vegetables for sale	○	○	○	○	○	○	○	○	○	○	○	○

6. Please give your approximate inventory, as of today's date, of all livestock and poultry. Include all animals on this farm now plus those sold in the last 12 months as part of normal commercial operations:

All cattle, calves, and cows	Hogs and pigs	Sheep and lambs	All poultry combined	All other livestock
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0 0 0	0 0 0 0
1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1 1 1	1 1 1 1
2 2 2 2	2 2 2 2	2 2 2 2	2 2 2 2 2 2	2 2 2 2
3 3 3 3	3 3 3 3	3 3 3 3	3 3 3 3 3 3	3 3 3 3
4 4 4 4	4 4 4 4	4 4 4 4	4 4 4 4 4 4	4 4 4 4
5 5 5 5	5 5 5 5	5 5 5 5	5 5 5 5 5 5	5 5 5 5
6 6 6 6	6 6 6 6	6 6 6 6	6 6 6 6 6 6	6 6 5 6
7 7 7 7	7 7 7 7	7 7 7 7	7 7 7 7 7 7	7 7 7 7
8 8 8 8	8 8 8 8	8 8 8 8	8 8 8 8 8 8	8 8 8 8
9 9 9 9	9 9 9 9	9 9 9 9	9 9 9 9 9 9	9 9 9 9

NOTE: RIGHT-JUSTIFY YOUR ANSWERS HERE. FOR EXAMPLE, 25 ANIMALS WOULD BE:

THIS → 2 5

NOT THIS → 2 5

7. What was the approximate sales value of all products (crops and animal) from this farm IN THE PAST 12 MONTHS?

○ 0 - $9,999 ○ $10,000 - $39,999 ○ $40,000 - $99,999 ○ $100,000 - $249,999 ○ $250,000 or more

B. Pesticide Use

8. During the last growing season, what pesticides were used on crops on this farm? Refer to LIST B (see enclosed yellow sheet) and record all that were used.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖ ㉗ ㉘ ㉙ ㉚ ㉛ ㉜ ㉝ ㉞ ㉟ ㊱ ㊲ ㊳ ㊴ ㊵ ㊶ ㊷

9. During the last growing season, were you personally involved in mixing, loading, or applying any of the pesticides?

○ Yes ○ No

10. During the NEXT growing season, what pesticides do you plan on using on crops on this farm? Refer again to LIST B and record all that you plan on using.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖ ㉗ ㉘ ㉙ ㉚ ㉛ ㉜ ㉝ ㉞ ㉟ ㊱ ㊲ ㊳ ㊴ ㊵ ㊶ ㊷

C. Census of Farm Dwellers

11. Please list the initials of the names of all persons who REGULARLY live or work on this farm, then complete the rest of the table. Persons listed here should include the Principal Operator (P.O.), the Operator's family who regularly lives and/or works on this farm, and other family members who may live in a separate residence on this farm. Please also include hired workers, friends, relatives, or roomers who regularly live and/or work on this farm. If there are more than 10 people involved, please provide the same information on a separate piece of paper, giving each a "person no." like in the table.

PERSON NO.	RECORD PERSON'S INITIALS	INDICATE SEX OF PERSON	INDICATE YEAR OF PERSON'S BIRTH	INDICATE RELATIONSHIP TO P.O. (Use LIST C)	INDICATE WHERE PERSON LIVES	PERFORMS PHYSICAL PART OF FARM OPERATION?	INDICATE 'PAY' STATUS ON THIS FARM
1	Principal Operator (P.O.)	○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
2		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
3		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
4		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
5		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
6		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
7		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
8		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
9		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid
10		○ Male ○ Female	10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 / 6 7 8 9 10	○ On this farm ○ Other farm ○ Elsewhere	○ Yes, regularly ○ Yes, occasionally ○ No	○ Paid ○ Unpaid

12. In addition to the individuals listed above in Question 11, are there other persons who worked on the commercial operation of this farm IN THE PAST 12 MONTHS such as seasonal workers, migrant workers, or others who may have worked or helped out on an OCCASIONAL basis?

○ No → SKIP TO Q. 13

○ Yes → **12a.** How many of these workers were there? NO. (0 0 / 1 1 / 2 2 / 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9)

12b. What were their usual job tasks? Refer to LIST D and select all codes that apply. (1 2 3 4 5 6 7 8 9 10)

12c. About how many days did they **typically** work on the farm IN THE PAST 12 MONTHS? NUMBER OF DAYS (0 0 0 / 1 1 1 / 2 2 2 / 3 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9)

D. Demographic Data on PRINCIPAL OPERATOR

13. Your date of birth is → MO (0 0 / 1 1 / 2 2 / 3 3 / 4 / 5 / 6 / 7 / 8 / 9) DAY (0 0 / 1 1 / 2 2 / 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9) YR (0 0 / 1 1 / 2 2 / 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9)

14. Your marital status is . . .
- ○ Married
- ○ Widowed
- ○ Divorced
- ○ Separated
- ○ Never married

15. For how many years total have you lived on this or any other agricultural locations? → YEARS (0 0 / 1 1 / 2 2 / 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9)

16a. Your race is . . .
- ○ White
- ○ Black
- ○ American Indian or Alaskan Native
- ○ Asian or Pacific Islander

16b. Your ethnicity is . . .
- ○ Hispanic origin
- ○ Not of Hispanic origin

17. Please indicate which category below best describes your education:

- ○ Did not graduate from High School
- ○ High School graduate
- ○ Some college
- ○ College graduate or higher

18a. Your sex is . . . ○ Male ○ Female

18b. Your weight is . . .

WEIGHT IN POUNDS
100 200 300
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

18c. Your height is . . .

FEET	INCHES	FRACTION
4 5 6	0 1 2 3 / 4 5 6 7 / 8 9 10 11	○ 1/4 ○ 1/2 ○ 3/4

E. Work History of PRINCIPAL OPERATOR

19. For each occupation listed to the right, please estimate the percentage of your time spent in each DURING THE PAST 12 MONTHS.

OCCUPATION	PERCENT OF TIME
Farming	0 10 20 30 40 50 60 70 80 90 100
Farm administration (record keeping, inventory, etc.)	0 10 20 30 40 50 60 70 80 90 100
Home making	0 10 20 30 40 50 60 70 80 90 100
Student	0 10 20 30 40 50 60 70 80 90 100
Other employment	0 10 20 30 40 50 60 70 80 90 100

20. How many days IN THE PAST 12 MONTHS did you work at least 4 hours per day on the operation of this farm?

- ○ None
- ○ 1 or more → INDICATE NUMBER OF DAYS

NUMBER OF DAYS
100 200 300
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

21. In operating this farm in a TYPICAL year, please indicate below, for each season of the year, the average number of hours you USUALLY work each week doing the chores shown. For chores you don't typically do, be sure to record zero hours per week. For this table, just WRITE IN your answers.

CHORES/TASKS		SUMMER (June - Aug.)	FALL (Sept. - Nov.)	WINTER (Dec. - Feb.)	SPRING (Mar. - May)
Equipment/machinery maintenance	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
All other maintenance (buildings, fences, etc.)	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
All livestock chores	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
Pesticide application	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
Fertilizer application	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
Welding	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
Tractor and/or machinery operation in the field	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
Operation of farmstead materials handling systems (augers, conveyors, etc.)	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
Operation of ag. machinery and/or trucks for market delivery (highway use)	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK
Total time spent on farm tasks outside the house	WRITE IN AVERAGE HOURS PER WEEK →	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK	HOURS PER WEEK

22. How many days IN THE PAST 12 MONTHS did you spend at least 4 hours per day at work UNRELATED to the operation of this farm?

- ○ None
- ○ 1 or more → INDICATE NUMBER OF DAYS

NUMBER OF DAYS
100 200 300
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

23. Have you worked or helped out on someone else's farm DURING THE PAST 12 MONTHS?

- ○ No → SKIP TO Q. 25
- ○ Yes → **24.** Indicate total number of days you worked on someone else's farm IN THE PAST 12 MONTHS, and the jobs you did.

NUMBER OF DAYS	SELECT ALL JOB TASKS FROM LIST D
100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9 10

25. Please give the following information on ANY NON-AGRICULTURAL work you did during the PAST 12 MONTHS.

WRITE IN TYPE OF PRODUCT MADE OR SERVICE PROVIDED	WRITE IN YOUR PRIMARY JOB TASKS, ACTIVITIES, OR DUTIES	INDICATE AVERAGE NUMBER OF HOURS WORKED PER WEEK	OFFICE USE ONLY INDUSTRY	OFFICE USE ONLY OCCUPATION
1.		10 20 30 40 50 60 70 80 90 / 0 1 2 3 4 5 6 7 8 9		
2.		10 20 30 40 50 60 70 80 90 / 0 1 2 3 4 5 6 7 8 9		

26. How many years total have you been involved in agricultural work? → INDICATE TOTAL HERE → TOTAL NUMBER OF YEARS: 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

27. Thinking of all the paid jobs or businesses you've ever had, what kind of work did you do the longest? Consider work done while in the Armed Forces. → WRITE IN

28. Considering all your employers, how many total years have you done this kind of work? → NO. OF YEARS: 0 1 2 3 4 5 6 7 8 9

29. When you were doing the kind of work you described in Question 27 above, what were your most important activities or duties? → WRITE IN / OFFICE USE ONLY OCCUPATION

30. In what kind of business or industry did you do this kind of work the LONGEST? (For example, retail shoe store, farm, construction, etc.) → WRITE IN / OFFICE USE ONLY INDUSTRY

F. Tobacco and Alcohol Use

31. Have you smoked at least 5 packs of cigarettes in your lifetime?

○ No
○ Yes → INDICATE HOW OLD YOU WERE WHEN YOU FIRST STARTED SMOKING CIGARETTES FAIRLY REGULARLY → YOUR AGE IN YEARS: 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

32. Do you smoke cigarettes NOW?

○ No → SKIP TO Q. 35
○ Yes → INDICATE NUMBER OF CIGARETTES YOU SMOKE NOW PER DAY, ON AVERAGE. (NOTE: ONE PACK = 20 CIGARETTES.) → NUMBER PER DAY: 0 1 2 3 4 5 6 7 8 9

33. For the entire time you smoked in the past, how many cigarettes did you smoke per day, on average? → INDICATE NUMBER OF CIGARETTES PER DAY → NUMBER PER DAY: 0 1 2 3 4 5 6 7 8 9

34. Have you EVER quit smoking cigarettes?

○ No
○ Yes → INDICATE TOTAL TIME YOU STAYED OFF CIGARETTES
- ○ Less than 1 year
- ○ 1 year or more → INDICATE NUMBER OF YEARS OFF → NO. OF YEARS: 0 1 2 3 4 5 6 7 8 9

35. Besides cigarettes, have you ever used any other form of tobacco on a fairly regular basis?

○ No ○ Yes

35a. Have you chewed tobacco?	○ No	○ Yes	IF YES →	Do you now?	○ No	○ Yes
35b. Have you used snuff?	○ No	○ Yes	IF YES →	Do you now?	○ No	○ Yes
35c. Have you smoked cigars?	○ No	○ Yes	IF YES →	Do you now?	○ No	○ Yes
35d. Have you smoked a pipe?	○ No	○ Yes	IF YES →	Do you now?	○ No	○ Yes

36. In your entire life, have you had at least 12 drinks of any kind of alcoholic beverage? Do not count small tastes. (NOTE: Alcoholic beverages include beer, ale, wine, wine coolers, liquor such as whiskey, gin, rum or vodka, and cocktails and mixed drinks containing liquor.)

○ No → SKIP TO Q. 39a, SECTION 2
○ Yes

37. In the PAST 12 MONTHS did you have at least 12 drinks of ANY kind of alcoholic beverage?

○ No
○ Yes

SKIP TO Q. 39a, SECTION 2

38a. IN THE PAST 12 MONTHS, on the average, how many days per week, month, or year did you drink ANY alcoholic beverages?

INDICATE NUMBER OF DAYS

NUMBER OF DAYS		
0	0	0
1	1	1
2	2	2
3	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9

PER WEEK, MONTH, OR YEAR?

○ Week
○ Month
○ Year

38b. On the average, on the days that you drank alcohol, how many drinks did you have a day? (NOTE: A drink is a 12-ounce beer, a 4-ounce glass of wine or an ounce of liquor.)

NUMBER OF DRINKS PER DAY
1 2 3 4 5 6 8 9 10 11 12

SECTION 2 Source of Medical Care

39a. We would like to know about your use of health care services. Is there a particular clinic, health center, doctor's office or some other place that you usually go to if you are sick or need advice about your health?

○ No ○ Yes

SKIP TO Q. 40

39b. What kind of a place is it – a clinic, a health center, a hospital, a doctor's office, or some other place? Select the most appropriate ONE from the list.

○ Home
○ Medical Doctor's Office (MD or DO) or Private Clinic
○ Company or School Clinic
○ Hospital Outpatient Clinic
○ Migrant Clinic
○ Other Clinic

PLEASE DESCRIBE

○ Chiropractor or Naturopath's Office
○ Hospital Emergency Room
○ Community, Neighborhood, or Family Health Center
○ Rural Health Center
○ HMO/Prepaid Group
○ Other

PLEASE DESCRIBE

SECTION 3 Stress and Well-Being

40. The questions here ask you about your feelings and behavior DURING THE LAST WEEK. In each case, you will be asked to indicate how often you felt or behaved a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

4 = Most or All of the Time (5-7 Days)
3 = Occasionally or a Moderate Amount of Time (3-4 Days)
2 = Some or a Little of the Time (1-2 Days)
1 = Rarely or None of the Time (Less than 1 Day)

DURING THE PAST WEEK:

a. I was bothered by things that usually don't bother me 1 2 3 4
b. I did not feel like eating; my appetite was poor .. 1 2 3 4
c. I felt that I could not shake off the blues even with help from my family or friends 1 2 3 4
d. I felt that I was just as good as other people 1 2 3 4
e. I had trouble keeping my mind on what I was doing 1 2 3 4
f. I felt depressed 1 2 3 4
g. I felt that everything I did was an effort 1 2 3 4
h. I felt hopeful about the future 1 2 3 4
i. I thought my life had been a failure 1 2 3 4

4 = Most or All of the Time (5-7 Days)
3 = Occasionally or a Moderate Amount of Time (3-4 Days)
2 = Some or a Little of the Time (1-2 Days)
1 = Rarely or None of the Time (Less than 1 Day)

j. I felt fearful 1 2 3 4
k. My sleep was restless 1 2 3 4
l. I was happy 1 2 3 4
m. I talked less than usual 1 2 3 4
n. I felt lonely 1 2 3 4
o. People were unfriendly 1 2 3 4
p. I enjoyed life 1 2 3 4
q. I had crying spells 1 2 3 4
r. I felt sad 1 2 3 4
s. I felt that people disliked me 1 2 3 4
t. I could not get "going" 1 2 3 4

41. **The questions here ask you about your feelings and thoughts DURING THE LAST MONTH. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.**

5 = Very Often
4 = Fairly Often
3 = Sometimes
2 = Almost Never
1 = Never

IN THE LAST MONTH:

a. How often have you been upset because of something that happened unexpectedly? ..... ① ② ③ ④ ⑤

b. How often have you felt that you were unable to control the important things in your life? ..... ① ② ③ ④ ⑤

c. How often have you felt nervous and "stressed"? ..... ① ② ③ ④ ⑤

d. How often have you felt confident about your ability to handle your personal problems? ..... ① ② ③ ④ ⑤

e. How often have you felt that things were going your way? ..... ① ② ③ ④ ⑤

5 = Very Often
4 = Fairly Often
3 = Sometimes
2 = Almost Never
1 = Never

f. How often have you found that you could not cope with all the things that you had to do? ... ① ② ③ ④ ⑤

g. How often have you been able to control irritations in your life? ..... ① ② ③ ④ ⑤

h. How often have you felt that you were on top of things? ..... ① ② ③ ④ ⑤

i. How often have you been angered because of things that happened that were outside of your control? ..... ① ② ③ ④ ⑤

j. How often have you felt difficulties were piling up so high that you could not overcome them? ..... ① ② ③ ④ ⑤

SECTION 4 Respiratory Conditions

42. Do you usually cough on most days for 3 CONSECUTIVE MONTHS OR MORE during the year?

○ No ○ Yes

43. For how many years have you had this cough?

○ Less than 1 year
○ 1 year or more → INDICATE NO. OF YEARS

YEARS: 00 11 22 33 44 55 66 77 88 99

SKIP TO Q. 44

44. Do you bring up phlegm on most days for 3 CONSECUTIVE MONTHS OR MORE during the year?

○ No ○ Yes

45. For how many years have you had trouble with phlegm?

○ Less than 1 year
○ 1 year or more → INDICATE NO. OF YEARS

YEARS: 00 11 22 44 55 66 77 88 99

SKIP TO Q. 46

46. Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill?

○ No ○ Yes

47. Have you had wheezing or whistling in your chest at any time in the PAST 12 MONTHS?

○ No → SKIP TO Q. 50
○ Yes → INDICATE NO. OF EPISODES

EPISODES: 000 111 222 333 444 555 666 777 888 999

48. How many times in the PAST 12 MONTHS were you hospitalized overnight or longer for these episodes of wheezing or whistling?

○ None
○ 1 or more → INDICATE NO. OF TIMES

TIMES: 00 11 22 33 44 55 66 77 88 99

49. During the PAST 12 MONTHS, how many times have you gone to a doctor's office or a hospital emergency room for one of these episodes of wheezing or whistling?

○ None
○ 1 or more → INDICATE NO. OF TIMES

TIMES: 00 11 22 33 44 55 66 77 88 99

50. Apart from when you had a cold, does your chest EVER sound wheezy or whistling?

○ No ○ Yes

51. During the PAST 12 MONTHS, have you had any episodes of stuffy, itchy, or runny nose?

○ No
○ Yes → INDICATE NO. OF EPISODES

EPISODES: 000 111 222 333 444 555 666 777 888 999

52. During the PAST 12 MONTHS, have you had any episodes of watery, itchy eyes?

○ No
○ Yes → INDICATE NO. OF EPISODES

EPISODES: 0 1 2 3 4 5 6 7 8 9

53. Did you answer "Yes" to any one of the following questions from above: 47, 50, 51, or 52?

○ No
○ Yes

SKIP TO Q. 56

54. Are any of the respiratory symptoms mentioned above (wheezing; whistling; stuffy, itchy, or runny nose; watery, itchy eyes) brought on by:

a. Exercise or cold air?	○ Yes	○ No	○ Don't know
b. Animals?	○ Yes	○ No	○ Don't know
c. House dust?	○ Yes	○ No	○ Don't know
d. Your work environment? (That is, do you feel better on days off?)	○ Yes	○ No	○ Don't know
e. Pollen?	○ Yes	○ No	○ Don't know

IF YOU ANSWERED "YES" TO Q. 54e ABOVE, ANSWER Q. 55

55. During which months of the year does pollen make your symptoms worse? Mark all that apply:

○ Jan ○ Feb ○ Mar ○ Apr ○ May ○ Jun ○ Jul ○ Aug ○ Sep ○ Oct ○ Nov ○ Dec

56. Have you EVER had a severe reaction, such as itching all over, trouble breathing, flushing, hives, or swelling of the face or hands or feet WITHIN AN HOUR after being stung by an insect?

○ No ○ Yes

57. Have you EVER had a severe reaction, such as itching all over, trouble breathing, flushing, hives, or swelling of the face or hands or feet WITHIN AN HOUR after receiving allergy shots or an allergy test?

○ No
○ Yes
○ Never received allergy shots or test
○ Don't know

58. Have you EVER given up or had to avoid a pet because of allergies?

○ No ○ Yes

59. During the PAST 12 MONTHS, have you had any of the following conditions

a. Cold or flu?
○ No
○ Yes → INDICATE NO. OF EPISODES: 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

b. Sinusitis or sinus problems?
○ No
○ Yes → INDICATE NO. OF EPISODES: 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

c. Pneumonia?
○ No
○ Yes → INDICATE NO. OF EPISODES: 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

60. Does your chest EVER feel tight in connection with work?

○ No
○ Yes

SKIP TO Q. 63

61. Does the chest tightness occur on any particular day?

○ No
○ Yes →

62. When does it occur?

○ Only during the first few days back at work
○ Other day(s) also
○ Only on other days

63. DURING THE PAST 12 MONTHS, have you had episodes of flu-like symptoms (fever, shivering, malaise, cough, tiredness, weakness, muscle and joint pains) in connection with dusty work?

○ No
○ Yes → INDICATE NO. OF TIMES

TIMES: 0 1 2 3 4 5 6 7 8 9

SKIP TO Q. 66

64. Please describe the circumstances when these symptoms occurred.

DESCRIBE CIRCUMSTANCES HERE

65. When experiencing the flu-like symptoms in connection with dusty work, how long, in general, would the symptoms last?

○ Until the next day
○ Several days
○ Don't know/Can't remember

66. How often do you wear any type of breathing protection when you are exposed to dust?

○ Usually (50% or more of the time)
○ Occasionally (less than 50% of the time)
○ Never
○ Not exposed to dust

SECTION 5 Hearing Loss

67. Which statement below best describes your hearing in your LEFT ear (without a hearing aid)?

- ○ Good
- ○ Little trouble
- ○ Lot of trouble
- ○ Deaf

68. Which statement below best describes your hearing in your RIGHT ear (without a hearing aid)?

- ○ Good
- ○ Little trouble
- ○ Lot of trouble
- ○ Deaf

IF YOU ISWERED OOD" TO 67, SKIP O Q. 76

69. (Without a hearing aid), can you usually HEAR and UNDERSTAND what a person says without seeing his face if that person WHISPERS to you from across a quiet room?

- ○ No
- ○ Yes

70. (Without a hearing aid), can you usually HEAR and UNDERSTAND what a person says without seeing his face if that person TALKS IN A NORMAL VOICE to you from across a quiet room?

- ○ No
- ○ Yes

71. (Without a hearing aid), can you usually HEAR and UNDERSTAND what a person says without seeing his face if that person SHOUTS to you from across a quiet room?

- ○ No
- ○ Yes

72. (Without a hearing aid), can you usually HEAR and UNDERSTAND what a person says without seeing his face if that person SPEAKS LOUDLY into your better ear?

- ○ No
- ○ Yes

73. Do you CURRENTLY have any trouble hearing?

- ○ No
- ○ Yes — INDICATE YOUR AGE WHEN TROUBLE BEGAN

AGE IN YEARS

74. Have you EVER seen a doctor about hearing trouble or deafness?

- ○ No
- ○ Yes

75. According to the doctor, what caused your hearing trouble or deafness? Select all that apply.

SKIP TO Q. 76

- ○ An ear infection
- ○ Exposure to loud noise
- ○ Ear surgery
- ○ An ear injury
- ○ Hearing trouble or deafness from birth
- ○ Some other cause
- ○ No cause identified

PLEASE DESCRIBE

76. Do you NOW work around, or have you EVER worked around, noisy farm equipment?

- ○ No
- ○ Yes

77. Do you wear hearing protection when you use or are around noisy farm equipment?

SKIP TO Q. 78

- ○ No
- ○ Yes, occasionally (less than 50% of the time)
- ○ Yes, usually (50% or more of the time)

78. Do you NOW have tinnitus (ringing in the ears)?

- ○ No
- ○ Yes

79. For EACH kind of equipment listed below, indicate whether or not you have EVER used it, even if you answered "No" to Question 76 above. If you have, then estimate the total number of years you have used the equipment, along with the average number of days per year and the average number of hours per day. If you've used a noisy piece of equipment not listed below, please use the blank space(s) provided for a description.

EQUIPMENT	EVER USED?	ESTIMATE TOTAL NUMBER OF YEARS USED	ESTIMATE AVERAGE NUMBER OF DAYS USED PER YEAR	ESTIMATE AVERAGE NUMBER OF HOURS USED PER DAY
Tractor without a cab	○ Yes → ○ No	10 20 30 40 50 60 / 1 2 3 4 5 6 7 8 9	100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	10 20 / 1 2 3 4 5 6 7 8 9
Tractor with a cab	○ Yes → ○ No	10 20 30 40 50 60 / 1 2 3 4 5 6 7 8 9	100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	10 20 / 1 2 3 4 5 6 7 8 9
Combine	○ Yes → ○ No	10 20 30 40 50 60 / 1 2 3 4 5 6 7 8 9	100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	10 20 / 1 2 3 4 5 6 7 8 9
Grain dryer	○ Yes → ○ No	10 20 30 40 50 60 / 1 2 3 4 5 6 7 8 9	100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	10 20 / 1 2 3 4 5 6 7 8 9
Chain saw	○ Yes → ○ No	10 20 30 40 50 60 / 1 2 3 4 5 6 7 8 9	100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	10 20 / 1 2 3 4 5 6 7 8 9
Other? PLEASE DESCRIBE	○ Yes → ○ No	10 20 30 40 50 60 / 1 2 3 4 5 6 7 8 9	100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	10 20 / 1 2 3 4 5 6 7 8 9
Other? PLEASE DESCRIBE	○ Yes → ○ No	10 20 30 40 50 60 / 1 2 3 4 5 6 7 8 9	100 200 300 / 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9	10 20 / 1 2 3 4 5 6 7 8 9

80. Do you NOW work at a job, in addition to farming, where you sometimes have to shout to be understood because of the noise?

○ No
○ Yes →

80a. DESCRIBE KIND OF JOB

80b. While exposed to noise on this job, do you wear hearing protection?

○ Yes, usually (50% or more of the time)
○ Yes, occasionally (less than 50% of the time)
○ No

81 Have you previously worked in ANY noisy job other than farming?

○ No
○ Yes → **FILL OUT TABLE BELOW**

DESCRIBE ALL PREVIOUS NOISY JOBS	ESTIMATE TOTAL NUMBER OF YEARS YOU HELD JOB	INDICATE FOR EACH JOB HELD WHETHER YOU WORE HEARING PROTECTION
1.	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	○ Yes, usually (50% or more of the time) ○ Yes, occasionally (less than 50% of the time) ○ No
2.	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	○ Yes, usually (50% or more of the time) ○ Yes, occasionally (less than 50% of the time) ○ No
3.	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	○ Yes, usually (50% or more of the time) ○ Yes, occasionally (less than 50% of the time) ○ No
4.	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	○ Yes, usually (50% or more of the time) ○ Yes, occasionally (less than 50% of the time) ○ No

82. Did you ever have a job that involved firing weapons, including military service?

○ No
○ Yes →

82a. Did you wear hearing protection when exposed to weapon noise?

○ Yes, usually (50% or more of the time)
○ Yes, occasionally (less than 50% of the time)
○ No

83. Away from work, have you ever been exposed to the noise associated with the following activities? For EACH activity listed below, indicate if you have ever engaged in the activity, and if you have, please fill out the rest of the table. "Usually" and "occasionally" are defined the same as in Questions 80-82 above.

ACTIVITY	EVER ENGAGE IN THE ACTIVITY?	ESTIMATE TOTAL NUMBER OF YEARS YOU'VE ENGAGED IN THE ACTIVITY	ESTIMATE AVERAGE NUMBER OF DAYS PER YEAR	ESTIMATE AVERAGE NUMBER OF HOURS PER DAY	WEAR HEARING PROTECTION?
Hunting	○ Yes → ○ No	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	①⓪⓪ ②⓪⓪ ③⓪⓪ ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮	○ Yes, usually ○ Yes, occasionally ○ No
Target shooting	○ Yes → ○ No	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	①⓪⓪ ②⓪⓪ ③⓪⓪ ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮	○ Yes, usually ○ Yes, occasionally ○ No
Riding a motorcycle	○ Yes → ○ No	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	①⓪⓪ ②⓪⓪ ③⓪⓪ ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮	○ Yes, usually ○ Yes, occasionally ○ No
Snowmobiling	○ Yes → ○ No	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	①⓪⓪ ②⓪⓪ ③⓪⓪ ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮	○ Yes, usually ○ Yes, occasionally ○ No
Playing in a rock band	○ Yes → ○ No	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	①⓪⓪ ②⓪⓪ ③⓪⓪ ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮	○ Yes, usually ○ Yes, occasionally ○ No
Other? PLEASE DESCRIBE	○ Yes → ○ No	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	①⓪⓪ ②⓪⓪ ③⓪⓪ ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮	○ Yes, usually ○ Yes, occasionally ○ No
Other? PLEASE DESCRIBE	○ Yes → ○ No	⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	①⓪⓪ ②⓪⓪ ③⓪⓪ ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮	○ Yes, usually ○ Yes, occasionally ○ No

SECTION 6 Injury

84. During the PAST 12 MONTHS, have you, a family member, or any other person who regularly lives or works on this farm had an injury for which the injured person saw or talked to a medical doctor or assistant, or the injured person cut down on their usual activities for more than half a day?

○ No → SKIP TO Q. 85a.

○ Yes → USE THE PERSON NUMBERS FROM QUESTION 11 ON PAGE 3 TO INDICATE IN THE GRID TO THE RIGHT WHO WAS INJURED. SELECT ALL THAT APPLY, THEN ANSWER QUESTIONS 84a THROUGH 84k FOR EACH INJURY. IF ONE PERSON WAS INJURED MORE THAN ONCE, CONSIDER EACH INJURY SEPARATELY. IF MORE THAN 3 INJURIES OCCURRED IN THE PAST 12 MONTHS, PLEASE PROVIDE THE SAME INFORMATION ON A SEPARATE PIECE OF PAPER.

ALL INJURED PERSONS - GET PERSON NUMBERS FROM Q. 11
① ② ③ ④ ⑤ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

INJURY 1 (THE MOST RECENT)

IDENTIFY INJURED PERSON WITH PERSON NUMBERS FROM QUESTION 11 → PERSON NO. FROM Q. 11: ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

84a. Please indicate the date of this injury.

MO	DAY	YEAR
0 0 1	0 0 1 2 3	0 1 2 3 4 5 6 7 8 9

84b. What part(s) of the body was/were injured? Refer to LIST E for body parts codes and select all that apply:
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

84c. What kind of injury was it? Refer to LIST F for kind of injury codes and select all that apply:
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒

84d. Describe how injury happened:

84e. Describe what the injured person was doing at the time of the injury:

84f. OTHER THAN THE DAY OF THE INJURY, how many FULL days of scheduled work did the injured person miss as a result of the injury?
100 200 300
10 20 30 40 50 60 70 80 90
0 1 2 3 4 5 6 7 8 9

84g. Was the injured person working at a job off the farm at the time of this injury? ○ Yes ○ No

84h. Did the injured person miss more than half of the day from work on the day of this injury? ○ Yes ○ No

84i. Was the activity the injured person was doing at the time of this injury part of the person's usual job tasks? ○ Yes ○ No

84j. Did the injured person make a permanent change in his/her work activities because of this injury? ○ Yes ○ No

84k. Did the injured person permanently change his/her off-the-job activities because of this injury? ○ Yes ○ No

INJURY 2 (NEXT MOST RECENT)

IDENTIFY INJURED PERSON WITH PERSON NUMBERS FROM QUESTION 11 → PERSON NO. FROM Q. 11: ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

84a. Please indicate the date of this injury.

MO	DAY	YEAR
0 0 1	0 0 1 2 3	0 1 2 3 4 5 6 7 8 9

84b. What part(s) of the body was/were injured? Refer to LIST E for body parts codes and select all that apply:
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

84c. What kind of injury was it? Refer to LIST F for kind of injury codes and select all that apply:
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒

84d. Describe how injury happened:

84e. Describe what the injured person was doing at the time of the injury:

84f. OTHER THAN THE DAY OF THE INJURY, how many FULL days of scheduled work did the injured person miss as a result of the injury?
100 200 300
10 20 30 40 50 60 70 80 90
0 1 2 3 4 5 6 7 8 9

84g. Was the injured person working at a job off the farm at the time of this injury? ○ Yes ○ No

84h. Did the injured person miss more than half of the day from work on the day of this injury? ○ Yes ○ No

84i. Was the activity the injured person was doing at the time of this injury part of the person's usual job tasks? ○ Yes ○ No

84j. Did the injured person make a permanent change in his/her work activities because of this injury? ○ Yes ○ No

84k. Did the injured person permanently change his/her off-the-job activities because of this injury? ○ Yes ○ No

INJURY 3 (NEXT MOST RECENT) → IDENTIFY INJURED PERSON WITH PERSON NUMBERS FROM QUESTION 11 → PERSON NO. FROM Q. 11: ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

84a. Please indicate the date of this injury.

MO		DAY		YEAR	
0	0	0	0		0
1	1	1	1		1
	2	2	2		2
	3	3	3		3
	4		4		4
	5		5		5
	6		6		6
	7		7		7
	8		8		8
	9		9	9	9

84b. What part(s) of the body was/were injured? Refer to LIST E for body parts codes and select all that apply:
① ② ③ ④ ⑤ ⑥ ⑦ ⑧
⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

84c. What kind of injury was it? Refer to LIST F for kind of injury codes and select all that apply:
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪
⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒

84d. Describe how injury happened:

84e. Describe what the injured person was doing at the time of the injury:

84f. OTHER THAN THE DAY OF THE INJURY, how many FULL days of scheduled work did the injured person miss as a result of the injury?
100 200 300
10 20 30 40 50 60 70 80 90
0 1 2 3 4 5 6 7 8 9

84g. Was the injured person working at a job off the farm at the time of this injury? ○ Yes ○ No

84h. Did the injured person miss more than half of the day from work on the day of this injury? ○ Yes ○ No

84i. Was the activity the injured person was doing at the time of this injury part of the person's usual job tasks? ○ Yes ○ No

84j. Did the injured person make a permanent change in his/her work activities because of this injury? ○ Yes ○ No

84k. Did the injured person permanently change his/her off-the-job activities because of this injury? ○ Yes ○ No

SECTION 7 Occupational Safety and Health

85a. Has anyone working on this farm had training in the prevention of occupational injuries or illnesses?
○ No
○ Yes → INDICATE WHICH AREA OF TRAINING → ○ Occupational injuries ○ Occupational illnesses ○ Both

85b. Have you made any major changes in equipment or processes in the past five years for reasons of health protection or injury prevention, and/or because of government advice?
○ No
○ Yes → INDICATE WHY CHANGES WERE MADE → ○ To protect health ○ Because of government advice ○ Both

85c. Have you made substitutions of the chemicals you used in the past five years for reasons of health protection and/or because of government advice?
○ No
○ Yes → INDICATE WHY CHANGES WERE MADE → ○ To protect health ○ Because of government advice ○ Both

85d. Have you received an on-site occupational health or safety consultation in the PAST 12 MONTHS, or has any on-site measurement or evaluation of exposure to dusts, gases, fumes, or physical agents (such as noise) been performed on this farm? Select all that apply below.
○ No
○ Yes, health or safety consultation
○ Yes, on-site measurement or evaluation of physical agent exposure (such as noise)
○ Yes, on-site measurement or evaluation of exposure to dusts, gases, or fumes

86. Do you feel that personal protective devices like goggles, steel-toed boots, or ear plugs are needed during the conduct of any of the operations of this farm?
○ No
○ Yes → INDICATE WHICH OPERATIONS BY SELECTING ALL JOB TASKS CODES FROM LIST D THAT APPLY. → TASK CODES FROM LIST D: ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

SECTION 8 Skin Conditions

87. Did any of the following substances get on your HANDS or ARMS while at work on the farm DURING THE PAST 12 MONTHS?

	Yes	No
a. Solvents or degreasers?	○	○
b. Petroleum products other than solvents (like grease, oil, or fuel)?	○	○
c. Soaps, detergents, or cleaning and disinfecting solutions used in performing your job?	○	○
d. Cutting oils, machine coolants, or metal working fluids?	○	○
e. Paints, varnishes, lacquers, or other coatings?	○	○
f. Glues, pastes, or other adhesives?	○	○
g. Pesticides, insecticides, herbicides, fungicides, or fumigants?	○	○
h. Did you get any other chemicals or substances on your hands or arms that could irritate the skin?	○	○

WHAT CHEMICALS OR SUBSTANCES?

88. During the PAST 12 MONTHS, have you had dermatitis, eczema, or any other red, inflamed skin rash?

○ No ○ Yes

SKIP TO SECTION 9

89. During the PAST 12 MONTHS, on about how many days altogether did you have a skin condition? Include days when you used treatment for the condition.

○ Every day
○ Not every day → INDICATE HOW MANY DAYS

DAYS

0	0	0
1	1	1
2	2	2
3	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9

90. What parts of your body were affected by this skin condition? Select all that apply.

○ Hands
○ Arms
○ Head, face, or neck
○ Other body parts → PLEASE SPECIFY

91. Did any skin conditions you had IN THE PAST 12 MONTHS result from chemicals or other substances that got on your skin?

○ No
○ Don't know
○ Yes → WHAT CHEMICALS OR SUBSTANCES?

92. Were you at work farming when these substances got on your skin?

SKIP TO SECTION 9

○ No
○ Don't know
○ Yes

SECTION 9 Selected Symptoms

93. Below is a list of questions concerning certain symptoms you may have had IN THE PAST 12 MONTHS. For each question below, mark the appropriate oval that indicates how often you've experienced the symptom IN THE PAST 12 MONTHS.

1 = Not at All
2 = A Little
3 = Moderately
4 = Quite a Bit
5 = Extremely

	1	2	3	4	5
a. Have you tired more easily than expected for the amount of activity you do?	○	○	○	○	○
b. Have you felt lightheaded or dizzy?	○	○	○	○	○
c. Have you had difficulty concentrating?	○	○	○	○	○
d. Have you been confused or disoriented?	○	○	○	○	○
e. Have you had trouble remembering things?	○	○	○	○	○
f. Have your relatives noticed that you have trouble remembering things?	○	○	○	○	○
g. Have you had to make notes to remember things?	○	○	○	○	○
h. Have you found it hard to understand the meaning of newspapers, magazines and books you have read?	○	○	○	○	○
i. Have you felt irritable?	○	○	○	○	○
j. Have you felt depressed?	○	○	○	○	○
k. Have you had heart palpitations even when not exerting yourself?	○	○	○	○	○
l. Have you had a seizure?	○	○	○	○	○
m. Have you been sleeping more often than is usual for you?	○	○	○	○	○
n. Have you had difficulty falling asleep?	○	○	○	○	○
o. Have you been bothered by lack of coordination or loss of balance?	○	○	○	○	○
p. Have you had any loss of muscle strength in your legs or feet?	○	○	○	○	○
q. Have you had any loss of muscle strength in your arms or hands?	○	○	○	○	○
r. Have you had difficulty moving your fingers or grasping things?	○	○	○	○	○
s. Have you had numbness or tingling in your *fingers* lasting more than a day?	○	○	○	○	○
t. Have you had numbness or tingling in your *toes* lasting more than a day?	○	○	○	○	○
u. Have you had headaches at least once a week?	○	○	○	○	○
v. Have you had difficulty driving after work because you felt dizzy or tired, even though you'd slept enough, etc.?	○	○	○	○	○
w. Have you felt 'high' from the chemicals you use at work?	○	○	○	○	○
x. Have you had a lower tolerance for alcohol (takes less to get drunk)?	○	○	○	○	○

NOTICE – Public reporting burden for collection of information in Sections 10-14 below is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to PHS Reports Clearance Officer; ATTN: PRA; Hubert H. Humphrey Bldg, Room 721-B; 200 Independence Ave., SW; Washington, DC 20201, and to the Office of Management and Budget; Paperwork Reduction Project (0920-0313); Washington, DC 20503.

OUR THANKS TO THE P.O. FOR COMPLETING SECTIONS 1-9. THE P.O.'s SPOUSE OR THE PERSON IN THE HOUSEHOLD CLOSEST IN AGE TO THE P.O. SHOULD FILL OUT THE REST OF THE QUESTIONNAIRE. PLEASE USE THE PERSON NO. FROM QUESTION 11 TO INDICATE THE IDENTITY OF THE SPOUSE OR CLOSEST-IN-AGE HOUSEHOLDER HERE →

PERSON NO. FROM Q.11
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

SECTION 10 Work History of Spouse or Closest-in-Age Householder

94. Your date of birth is →

MO	DAY	YR
0 0 1 1 2 3 4 5 6 7 8 9	0 0 1 1 2 3 4 5 6 7 8 9	0 0 1 1 2 3 4 5 6 7 8 9

95a. Your sex is . . .
- ○ Male
- ○ Female

95b. Your race is . . .
- ○ White
- ○ Black
- ○ American Indian or Alaskan Native
- ○ Asian or Pacific Islander

95c. Your ethnicity is . . .
- ○ Hispanic origin
- ○ Not of Hispanic origin

96. Please indicate which category below best describes your education:
- ○ Did not graduate from High School
- ○ High School graduate
- ○ Some college
- ○ College graduate or higher

97. For how many years total have you lived on this or any other agricultural location(s)? →

NUMBER OF YEARS
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

98. For each occupation listed to the right, please estimate the percentage of your time spent in each DURING THE PAST 12 MONTHS. →

OCCUPATION	PERCENT OF TIME
Farming	0 10 20 30 40 50 60 70 80 90 100
Farm administration (record keeping, inventory, etc.)	0 10 20 30 40 50 60 70 80 90 100
Home making	0 10 20 30 40 50 60 70 80 90 100
Student	0 10 20 30 40 50 60 70 80 90 100
Other employment	0 10 20 30 40 50 60 70 80 90 100

99. How many days IN THE PAST 12 MONTHS did you work at least 4 hours per day on the operation of this farm?
- ○ None
- ○ 1 or more → INDICATE NUMBER OF DAYS →

NUMBER OF DAYS
100 200 300
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

100. In operating this farm in a TYPICAL year, please indicate in the table to the right the tasks you TYPICALLY do during each season. Use LIST D and select all that apply. →

SEASON	SELECT TASK CODES FROM LIST D
WINTER	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
FALL	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
SUMMER	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
SPRING	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

101. How many days in the PAST 12 MONTHS did you work at least 4 hours per day at work UNRELATED to the operation of this farm?
- ○ None
- ○ 1 or more → INDICATE NUMBER OF DAYS →

NUMBER OF DAYS
100 200 300
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

102. Please give the following information on ANY NON-AGRICULTURAL work you did DURING THE PAST 12 MONTHS.

WRITE IN TYPE OF PRODUCT MADE OR SERVICE PROVIDED	WRITE IN YOUR PRIMARY JOB TASKS, ACTIVITIES, OR DUTIES	INDICATE AVERAGE NUMBER OF HOURS WORKED PER WEEK	OFFICE USE ONLY	
			INDUSTRY	OCCUPATION
1.		10 20 30 40 50 60 70 80 90 / 0 1 2 3 4 5 6 7 8 9		
2.		10 20 30 40 50 60 70 80 90 / 0 1 2 3 4 5 6 7 8 9		
3.		10 20 30 40 50 60 70 80 90 / 0 1 2 3 4 5 6 7 8 9		

103. BLANK - Go to QUESTION 104.

SECTION 11 Tobacco and Alcohol Use of Spouse or Closest-in-Age Householder

104. Have you smoked at least 5 packs of cigarettes in your lifetime?

○ No
○ Yes → INDICATE HOW OLD YOU WERE WHEN YOU FIRST STARTED SMOKING CIGARETTES FAIRLY REGULARLY → YOUR AGE IN YEARS (10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9)

SKIP TO Q. 108

105. Do you smoke cigarettes NOW?

○ No
○ Yes → INDICATE NUMBER OF CIGARETTES YOU SMOKE NOW PER DAY, ON AVERAGE. (NOTE: ONE PACK = 20 CIGARETTES.) → NUMBER PER DAY (0 0 / 1 1 / 2 2 / 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9)

106. For the entire time you smoked in the past, how many cigarettes did you smoke per day, on average? → INDICATE NUMBER OF CIGARETTES PER DAY → NUMBER PER DAY (0 0 / 1 1 / 2 2 / 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9)

107. Have you EVER quit smoking cigarettes?

○ No
○ Yes → INDICATE TOTAL TIME YOU STAYED OFF CIGARETTES
- ○ Less than 1 year
- ○ 1 year or more → INDICATE NUMBER OF YEARS OFF → NO. OF YEARS (0 0 / 1 1 / 2 2 / 3 3 / 4 4 / 5 5 / 6 6 / 7 7 / 8 8 / 9 9)

108. In your entire life, have you had at least 12 drinks of any kind of alcoholic beverage? Do not count small tastes. (NOTE: Alcoholic beverages include beer, ale, wine, wine coolers, liquor such as whiskey, gin, rum or vodka, and cocktails and mixed drinks containing liquor.)

○ No ○ Yes

109. In the PAST 12 MONTHS did you have at least 12 drinks of ANY kind of alcoholic beverage?

○ No ○ Yes

SECTION 12 Selected Conditions

110. Does ANYONE in your household NOW have:

a. Deafness in one or both ears?	○ No	○ Yes →	INDICATE WHO IN YOUR HOUSEHOLD BY SELECTING THE PERSON NO. FROM QUESTION 11. SELECT ALL THAT APPLY.	→ PERSON NO. FROM Q. 11 (1 2 3 4 5 6 7 8 9 10)
b. Any other trouble hearing with one or both ears?	○ No	○ Yes →	INDICATE WHO IN YOUR HOUSEHOLD BY SELECTING THE PERSON NO. FROM QUESTION 11. SELECT ALL THAT APPLY.	→ PERSON NO. FROM Q. 11 (1 2 3 4 5 6 7 8 9 10)
c. Tinnitus (ringing in the ears)?	○ No	○ Yes →	INDICATE WHO IN YOUR HOUSEHOLD BY SELECTING THE PERSON NO. FROM QUESTION 11. SELECT ALL THAT APPLY.	→ PERSON NO. FROM Q. 11 (1 2 3 4 5 6 7 8 9 10)
d. A missing finger, hand or arm?	○ No	○ Yes →	INDICATE WHO IN YOUR HOUSEHOLD BY SELECTING THE PERSON NO. FROM QUESTION 11. SELECT ALL THAT APPLY.	→ PERSON NO. FROM Q. 11 (1 2 3 4 5 6 7 8 9 10)
e. A missing toe, foot, or leg?	○ No	○ Yes →	INDICATE WHO IN YOUR HOUSEHOLD BY SELECTING THE PERSON NO. FROM QUESTION 11. SELECT ALL THAT APPLY.	→ PERSON NO. FROM Q. 11 (1 2 3 4 5 6 7 8 9 10)
f. PERMANENT stiffness or any deformity of the foot, leg, or back?	○ No	○ Yes →	INDICATE WHO IN YOUR HOUSEHOLD BY SELECTING THE PERSON NO. FROM QUESTION 11. SELECT ALL THAT APPLY.	→ PERSON NO. FROM Q. 11 (1 2 3 4 5 6 7 8 9 10)
g. PERMANENT stiffness or any deformity of the fingers, hand, or arm?	○ No	○ Yes →	INDICATE WHO IN YOUR HOUSEHOLD BY SELECTING THE PERSON NO. FROM QUESTION 11. SELECT ALL THAT APPLY.	→ PERSON NO. FROM Q. 11 (1 2 3 4 5 6 7 8 9 10)

SECTION 13 Cancer

111. Has a doctor or other health professional ever told anyone in your household (including yourself) that they (or you) had any kind of cancer? If more than 4 people have been diagnosed, please provide the information on a separate piece of paper.

○ No
○ Yes → INDICATE IN TABLE BELOW EACH PERSON EVER DIAGNOSED, THE KIND OF CANCER, AND THEIR AGE AT DIAGNOSIS

GO TO SECTION 14

INDICATE FOR EACH PERSON DIAGNOSED, HIS/HER PERSON NO. FROM Q. 11	INDICATE TYPE OF CANCER. SELECT FROM LIST G.	INDICATE THE YEAR HE/SHE WAS DIAGNOSED
PERSON 1 PERSON NO. FROM Q. 11 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	LIST G CODES ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖	YEAR OF DIAGNOSIS ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
PERSON 2 PERSON NO. FROM Q. 11 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	LIST G CODES ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖	YEAR OF DIAGNOSIS ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
PERSON 3 PERSON NO. FROM Q. 11 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	LIST G CODES ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖	YEAR OF DIAGNOSIS ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
PERSON 4 PERSON NO. FROM Q. 11 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	LIST G CODES ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ ㉖	YEAR OF DIAGNOSIS ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

SECTION 14 The Last Two Questions

112. Please indicate here who filled out Sections 1 - 9 → PERSON NO. FROM Q. 11 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ → INDICATE NUMBER OF MINUTES IT TOOK HIM/HER TO COMPLETE SECTIONS 1 - 9 → NUMBER OF MINUTES ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ / ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

113. Please indicate here who filled out Sections 10 - 13 → PERSON NO. FROM Q. 11 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ → INDICATE NUMBER OF MINUTES IT TOOK HIM/HER TO COMPLETE SECTIONS 10 - 13 → NUMBER OF MINUTES ⑩ ⑳ ㉚ ㊵ ㊿ ⑥⓪ ⑦⓪ ⑧⓪ ⑨⓪ / ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

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APPENDIX 2

Three Variable Models for Continuous Variables—Right Ear

Model	Third Variable	Adjusted ORs, p-value, 95% CI								
		500	1000	2000	3000	4000	6000	8000	LPTA	HPTA
HTL+age	Marital Status	1.01, 0.27, 0.96-1.01	1.02, 0.13, 1.00-1.04	1.01, 0.17, 1.00-1.04	1.00, 0.97, 0.98-1.02	1.00, 0.69, 0.99-1.02	1.01, 0.45, 0.99-1.02	1.00, 0.99, 0.98-1.02	1.02, 0.17, 0.99-1.05	1.00, 0.78, 0.98-1.02
HTL+age	Education	1.01, 0.644, 0.98-1.03	1.04, 0.82, 1.00-1.04	1.01, 0.16, 1.00-1.04	1.00, 0.91, 0.98-1.02	1.00, 0.76, 0.99-1.02	1.01, 0.44, 0.99-1.02	1.00, 0.96, 0.98-1.02	1.02, 0.16, 0.99-1.05	1.00, 0.75, 0.98-1.02
HTL+age	Other Tobacco	1.01, 0.675, 0.98-1.03	1.02, 0.16, 1.00-1.04	1.01, 0.21, 0.99-1.03	1.00, 0.84, 0.98-1.02	1.00, 0.62, 0.99-1.02	1.01, 0.29, 0.99-1.03	1.00, 0.81, 0.98-1.02	1.02, 0.21, 0.99-1.05	1.00, 0.70, 0.98-1.02
HTL+age	Current Smoker	1.01, 0.60, 0.98-1.03	1.02, 0.11, 1.00-1.04	1.01, 0.17, 0.99-1.03	1.00, 0.87, 0.98-1.02	1.00, 0.77, 0.99-1.02	1.01, 0.41, 0.99-1.02	1.00, 0.96, 0.98-1.02	1.02, 0.15, 0.99-1.05	1.00, 0.80, 0.98-1.02
HTL+age	Past Smoker	1.01, 0.60, 0.98-1.03	1.02, 0.11, 1.00-1.04	1.01, 0.16, 1.00-1.03	1.00, 0.89, 0.98-1.02	1.00, 0.77, 0.99-1.02	1.01, 0.41, 0.99-1.02	1.00, 0.95, 0.98-1.02	1.02, 0.15, 0.99-1.05	1.00, 0.79, 0.98-1.02
HTL+age	Drink alcohol within the past 12 months	1.01, 0.61, 0.98-1.03	1.02, 0.12, 1.00-1.04	1.01, 0.17, 1.00-1.03	1.00, 0.86, 0.98-1.02	1.00, 0.81, 0.99-1.02	1.01, 0.43, 0.99-1.02	1.00, 0.95, 0.98-1.02	1.02, 0.16, 0.99-1.05	1.00, 0.85, 0.98-1.02
HTL+age	Ever drank alcohol	1.01, 0.58, 0.98-1.03	1.02, 0.10, 1.00-1.04	1.01, 0.16, 1.00-1.03	1.00, 0.92, 0.98-1.02	1.00, 0.75, 0.99-1.02	1.01, 0.41, 0.99-1.02	1.00, 0.93, 0.98-1.02	1.02, 0.15, 0.99-1.05	1.00, 0.79, 0.98-1.02
HTL+age	Total annual sales	1.01, 0.58, 0.98-1.03	1.02, 0.90, 1.00-1.04	1.02, 0.12, 1.00-1.04	1.00, 0.95, 0.99-1.02	1.00, 0.56, 0.99-1.02	1.01, 0.40, 0.99-1.02	1.00, 0.97, 0.98-1.02	1.02, 0.12, 0.99-1.05	1.00, 0.64, 0.98-1.02
HTL+age	Total animals	1.01, 0.59, 0.98-1.03	1.00, 0.89, 0.99-1.00	1.01, 0.15, 1.00-1.03	1.00, 0.89, 0.98-1.02	1.00, 0.80, 0.99-1.02	1.01, 0.42, 0.99-1.02	1.00, 0.92, 0.98-1.02	1.02, 0.15, 0.99-1.05	1.00, 0.81, 0.98-1.02
HTL+age	Time spent on someone else's farm	1.01, 0.56, 0.98-1.03	1.02, 0.09, 1.00-1.04	1.02, 0.14, 1.00-1.04	1.00, 0.98, 0.98-1.02	1.00, 0.70, 0.99-1.02	1.01, 0.51, 0.99-1.02	1.00, 0.83, 0.98-1.02	1.02, 0.13, 0.99-1.05	1.00, 0.81, 0.98-1.02
HTL+age	% of time spent farming	1.01, 0.33, 1.00-1.01	1.02, 0.07, 1.00-1.04	1.02, 0.13, 1.00-1.04	1.00, 0.94, 0.98-1.02	1.00, 0.75, 0.99-1.02	1.01, 0.39, 0.99-1.03	1.00, 0.90, 0.98-1.02	1.02, 0.11, 0.99-1.05	1.00, 0.76, 0.98-1.02

Three Variable Models for Continuous Variables—Left Ear

Model	Third Variable	Adjusted ORs, p-values, 95% CI								
		Left Ear								
		500	1000	2000	3000	4000	6000	8000	LPTA	HPTA
HTL+age	Marital Status	1.03, 0.04, 1.00-1.05	1.02, 0.10, 1.00-1.04	1.00, 0.77, 0.99-1.02	1.01, 0.43, 0.99-1.02	1.01, 0.46, 0.99-1.02	1.01, 0.08, 1.00-1.03	1.01, 0.48, 0.99-1.02	1.02, 0.14, 1.00-1.04	1.01, 0.24, 0.99-1.03
HTL+age	Education	1.03, 0.04, 1.00-1.05	1.02, 0.10, 1.00-1.04	1.00, 0.77, 0.98-1.02	1.01, 0.42, 0.99-1.02	1.01, 0.49, 0.99-1.02	1.01, 0.09, 1.00-1.03	1.01, 0.57, 0.99-1.02	1.02, 0.14, 0.99-1.04	1.01, 0.24, 0.99-1.03
HTL+age	Other Tobacco	1.03, 0.07, 1.00-1.05	1.02, 0.17, 0.99-1.04	1.00, 0.75, 0.99-1.02	1.01, 0.52, 0.99-1.02	1.01, 0.56, 0.99-1.02	1.01, 0.06, 1.00-1.03	1.01, 0.41, 0.99-1.02	1.02, 0.23, 0.99-1.04	1.01, 0.26, 0.99-1.03
HTL+age	Current Smoker	1.03, 0.04, 1.00-1.05	1.02, 0.10, 1.00-1.04	1.00, 0.95, 0.98-1.02	1.01, 0.46, 0.99-1.02	1.01, 0.51, 0.99-1.02	1.01, 0.09, 1.00-1.03	1.01, 0.57, 0.99-1.02	1.02, 0.15, 0.99-1.04	1.01, 0.28, 0.99-1.03
HTL+age	Past Smoker	1.03, 0.04, 1.00-1.05	1.02, 0.10, 1.00-1.04	1.00, 0.76, 0.99-1.02	1.01, 0.43, 0.99-1.02	1.01, 0.50, 0.99-1.02	1.01, 0.09, 1.00-1.03	1.01, 0.53, 0.99-1.02	1.02, 0.14, 0.99-1.04	1.01, 0.26, 0.99-1.03
HTL+age	Drink alcohol within the past 12 months	1.03, 0.05, 1.00-1.05	1.02, 0.11, 1.00-1.04	1.00, 0.81, 0.99-1.02	1.01, 0.44, 0.99-1.02	1.01, 0.51, 0.99-1.02	1.01, 0.09, 1.00-1.03	1.01, 0.54, 0.99-1.02	1.02, 0.16, 0.99-1.04	1.01, 0.27, 0.99-1.03
HTL+age	Ever drank alcohol	1.03, 0.04, 1.00-1.05	1.02, 0.08, 1.00-1.04	1.00, 0.75, 0.99-1.02	1.01, 0.41, 0.99-1.02	1.01, 0.49, 0.99-1.02	1.01, 0.09, 1.00-1.03	1.01, 0.57, 0.99-1.02	1.02, 0.13, 1.00-1.04	1.01, 0.26, 0.99-1.03
HTL+age	Total annual sales	1.03, 0.02, 1.00-1.05	1.02, 0.05, 1.00-1.04	1.01, 0.54, 0.99-1.02	1.01, 0.43, 0.99-1.02	1.01, 0.27, 0.99-1.03	1.01, 0.05, 1.00-1.03	1.01, 0.47, 0.99-1.02	1.02, 0.07, 1.00-1.04	1.01, 0.14, 1.00-1.03
HTL+age	Total animals	1.03, 0.04, 1.00-1.05	1.02, 0.10, 1.00-1.04	1.00, 0.75, 0.98-1.02	1.01, 0.43, 0.99-1.02	1.01, 0.53, 0.99-1.02	1.01, 0.09, 1.00-1.03	1.01, 0.53, 0.99-1.02	1.02, 0.13, 1.00-1.04	1.01, 0.27, 0.99-1.03
HTL+age	Time spent on someone else's farm	1.03, 0.04, 1.00-1.05	1.02, 0.10, 1.00-1.04	1.00, 0.71, 0.99-1.02	1.01, 0.43, 0.99-1.02	1.01, 0.42, 0.99-1.02	1.01, 0.07, 1.00-1.03	1.01, 0.63, 0.99-1.02	1.02, 0.13, 1.00-1.04	1.01, 0.21, 0.99-1.03
HTL+age	% of time spent farming	1.03, 0.04, 1.00-1.05	1.02, 0.08, 1.00-1.04	1.00, 0.72, 0.99-1.02	1.01, 0.43, 0.99-1.02	1.01, 0.45, 0.99-1.02	1.01, 0.08, 1.00-1.03	1.01, 0.64, 0.99-1.02	1.02, 0.12, 1.00-1.04	1.01, 0.25, 0.99-1.03

Three Variable Models for Continuous Variables—Binaural and Worse Ear

Model	Third Variable	Adjusted ORs, p-values, 95% CI							
		500	1000	2000	3000	4000	6000	8000	Worse Ear
HTL+age	Marital Status	1.02, 0.15, 0.99-1.05	1.02, 0.06, 1.00-1.05	1.01, 0.35, 0.99-1.03	1.00, 0.64, 0.99-1.02	1.01, 0.54, 0.99-1.03	1.02, 0.12, 1.00-1.03	1.00, 0.89, 0.98-1.02	1.02, 0.11, 1.00-1.04
HTL+age	Education	1.02, 0.15, 0.99-1.05	1.03, 0.05, 1.00-1.05	1.01, 0.34, 0.99-1.03	1.00, 0.65, 0.99-1.02	1.01, 0.49, 0.99-1.03	1.02, 0.10, 1.00-1.03	1.00, 0.97, 0.98-1.02	1.02, 0.12, 1.00-1.04
HTL+age	Other Tobacco	1.02, 0.19, 0.99-1.05	1.02, 0.10, 1.00-1.05	1.01, 0.47, 0.99-1.03	1.00, 0.76, 0.99-1.02	1.01, 0.51, 0.99-1.03	1.02, 0.07, 1.00-1.03	1.00, 0.70, 0.98-1.02	1.02, 0.14, 0.99-1.04
HTL+age	Current Smoker	1.02, 0.14, 0.99-1.05	1.02, 0.06, 1.00-1.05	1.01, 0.37, 0.99-1.03	1.00, 0.70, 0.99-1.02	1.01, 0.56, 0.99-1.03	1.02, 0.11, 1.00-1.03	1.00, 0.95, 0.98-1.02	1.02, 0.13, 1.00-1.04
HTL+age	Past Smoker	1.02, 0.14, 0.99-1.05	1.02, 0.05, 1.00-1.05	1.01, 0.34, 0.99-1.03	1.00, 0.68, 0.99-1.02	1.01, 0.56, 0.99-1.02	1.02, 0.11, 1.00-1.03	1.00, 0.93, 0.98-1.02	1.02, 0.12, 1.00-1.04
HTL+age	Drink alcohol within the past 12 months	1.02, 0.15, 0.99-1.05	1.02, 0.06, 1.00-1.05	1.01, 0.37, 0.99-1.03	1.00, 0.69, 0.99-1.02	1.01, 0.58, 0.99-1.02	1.02, 0.12, 1.00-1.03	1.00, 0.93, 0.98-1.02	1.02, 0.13, 1.00-1.04
HTL+age	Ever drank alcohol	1.02, 0.13, 0.99-1.05	1.02, 0.05, 1.00-1.05	1.01, 0.34, 0.99-1.03	1.00, 0.65, 0.99-1.02	1.01, 0.55, 0.99-1.03	1.02, 0.11, 1.00-1.03	1.00, 0.98, 0.98-1.02	1.02, 0.11, 1.00-1.04
HTL+age	Total annual sales	1.02, 0.10, 0.99-1.05	1.02, 0.03, 1.00-1.05	1.01, 0.23, 0.99-1.03	1.01, 0.50, 0.99-1.02	1.01, 0.32, 0.99-1.03	1.02, 0.08, 1.02-1.04	1.00, 0.83, 0.98-1.02	1.02, 0.06, 1.00-1.04
HTL+age	Total animals	1.02, 0.13, 0.99-1.05	1.02, 0.05, 1.00-1.05	1.01, 0.33, 0.99-1.03	1.00, 0.68, 0.99-1.02	1.01, 0.59, 0.99-1.02	1.02, 0.11, 1.00-1.03	1.00, 0.83, 0.98-1.02	1.02, 0.12, 1.00-1.04
HTL+age	Time spent on someone else's farm	1.02, 0.13, 0.99-1.05	1.02, 0.05, 1.00-1.05	1.01, 0.31, 0.99-1.03	1.01, 0.60, 0.99-1.02	1.01, 0.48, 0.99-1.02	1.02, 0.12, 1.00-1.03	1.00, 0.97, 0.98-1.02	1.02, 0.11, 1.00-1.04
HTL+age	% of time spent farming	1.02, 0.12, 0.99-1.05	1.03, 0.04, 1.00-1.05	1.01, 0.32, 0.99-1.03	1.00, 0.64, 0.99-1.02	1.01, 0.51, 0.99-1.03	1.02, 0.10, 1.00-1.04	1.00, 0.94, 0.98-1.02	1.02, 0.12, 1.00-1.04

APPENDIX 3

Three Variable Models for Categorical Variables—Right Ear

		500	1000	2000	3000	4000	6000	8000	LPTA	HPTA
HTL+age	Marital Status	0.50, 0.26, 0.15-1.67	1.93, 0.13, 0.83-4.50	1.28, 0.54, 0.58-2.83	0.76, 0.44, 0.38-1.52	1.36, 0.40, 0.67-2.74	1.90, 0.18, 0.85-4.23	0.86, 0.67, 0.42-1.75	1.83, 0.15, 0.80-4.18	1.53, 0.26, 0.74-3.18
HTL+age	Education	1.02, 0.90, 0.74-1.40	1.82, 0.16, 0.78-4.23	1.21, 0.63, 0.55-2.67	0.73, 0.36, 0.37-1.44	1.31, 0.46, 0.65-2.64	2.25, 0.47, 1.01-5.00	0.89, 0.73, 0.45-1.74	1.75, 0.19, 0.77-4.00	1.52, 0.26, 0.73-3.16
HTL+age	Other Tobacco	0.49, 0.25, 0.14-1.64	1.66, 0.26, 0.69-4.00	1.11, 0.79, 0.49, 2.51	0.71, 0.34, 0.36-1.43	1.33, 0.42, 0.66-2.68	2.14, 0.06, 0.97-4.75	0.98, 0.96, 0.47-2.04	1.58, 0.29, 0.67-3.73	1.51, 0.26, 0.73-3.13
HTL+age	Current Smoker	0.48, 0.24, 0.14-1.61	1.83, 0.16, 0.79-4.26	1.20, 0.65, 0.55-2.64	0.73, 0.36, 0.37-1.43	1.29, 0.47, 0.65-2.59	2.17, 0.06, 0.98-4.79	0.91, 0.80, 0.44-1.87	1.79, 0.17, 0.78-4.10	1.47, 0.29, 0.72-3.03
HTL+age	Past Smoker	0.48, 0.23, 0.14-1.59	1.83, 0.16, 0.79-4.24	1.22, 0.62, 0.56-2.68	0.73, 0.37, 0.37-1.45	1.30, 0.46, 0.65-2.60	2.18, 0.05, 0.99-4.84	0.90, 0.77, 0.45-1.81	1.77, 0.17, 0.77-4.04	1.48, 0.29, 0.72-3.05
HTL+age	Drink alcohol within the past 12 months	0.48, 0.23, 0.14-1.60	1.83, 0.16, 0.79-4.24	1.22, 0.63, 0.56-2.66	0.73, 0.36, 0.36-1.44	1.27, 0.49, 0.64-2.55	2.22, 0.05, 1.00-4.94	0.89, 0.76, 0.43-1.83	1.77, 0.18, 0.78-4.03	1.44, 0.32, 0.70-2.97
HTL+age	Ever drank alcohol	0.42, 0.25, 0.15-1.64	1.86, 0.15, 0.80-4.30	1.22, 0.63, 0.55-2.67	0.74, 0.38, 0.37-1.46	1.30, 0.46, 0.65-2.62	2.18, 0.05, 0.99-4.84	0.90, 0.77, 0.44-1.84	1.79, 0.17, 0.79-4.09	1.48, 0.30, 0.71-3.06
HTL+age	Total annual sales	0.42, 0.25, 0.15-1.64	1.89, 0.14, 0.81-4.42	1.32, 0.50, 0.59-2.93	0.79, 0.51, 0.40-1.59	1.50, 0.27, 0.73-3.05	2.19, 0.06, 0.98-4.87	0.95, 0.87, 0.49-1.84	1.87, 0.14, 0.81, 4.32	1.51, 0.27, 0.72-3.15
HTL+age	Total animals	0.48, 0.23, 0.14-1.60	1.83, 0.16, 0.79-4.26	1.23, 0.61, 0.56-2.70	0.74, 0.38, 0.37-1.46	1.28, 0.49, 0.64-2.55	2.15, 0.06, 0.97-4.75	0.88, 0.71, 0.44-1.76	1.77, 0.17, 0.78-4.04	1.45, 0.31, 0.71-2.99
HTL+age	Time spent on someone else's farm	0.47, 0.22, 0.14-1.58	1.84, 0.16, 0.79-4.31	1.27, 0.57, 0.57-2.82	0.75, 0.40, 0.38-1.47	1.30, 0.47, 0.64-2.62	2.08, 0.07, 0.94-4.62	0.88, 0.71, 0.46-1.68	1.75, 0.19, 0.76-4.02	1.45, 0.32, 0.70-3.02
HTL+age	% of time spent farming	0.50, 0.26, 0.15-1.68	2.01, 0.11, 0.86-4.70	1.34, 0.47, 0.61-3.00	0.71, 0.32, 0.35-1.41	1.26, 0.51, 0.63-2.55	2.12, 0.07, 0.95-4.73	0.88, 0.73, 0.43-1.83	1.94, 0.12, 0.84-4.45	1.45, 0.32, 0.70-3.01

Three Variable Models for Categorical Variables—Left Ear

Model	Third Variable	Adjusted ORs, p-values, 95% CI								
		500	1000	2000	3000	4000	6000	8000	LPTA	HPTA
HTL+age	Marital Status	1.71, 0.23, 0.71-4.13	1.81, 0.18, 0.77-4.29	1.07, 0.86, 0.52-2.22	1.63, 0.17, 0.82-3.23	1.21, 0.60, 0.59-2.46	1.90, 0.12, 0.85-4.23	1.55, 0.25, 0.74-3.26	1.14, 0.75, 0.50-2.60	1.96, 0.07, 0.94-4.06
HTL+age	Education	1.67, 0.25, 0.69-4.01	1.74, 0.20, 0.74-4.06	1.10, 0.80, 0.54-2.23	1.77, 0.11, 0.89-3.51	1.14, 0.71, 0.57-2.31	2.25, 0.05, 1.01-5.00	1.43, 0.35, 0.68-2.99	1.04, 0.92, 0.46-2.35	2.07, 0.05, 1.00-4.30
HTL+age	Other Tobacco	1.37, 0.51, 0.54-3.48	1.45, 0.41, 0.60-3.53	1.00, 0.99, 0.49-2.06	1.75, 0.11, 0.88-3.48	1.13, 0.74, 0.56-2.27	2.14, 0.06, 0.97-4.75	1.58, 0.23, 0.75-3.31	0.89, 0.78, 0.38-2.07	2.04, 0.06, 0.99-4.21
HTL+age	Current Smoker	1.71, 0.24, 0.71-4.12	1.69, 0.23, 0.72-3.96	1.08, 0.84, 0.53-2.18	1.73, 0.12, 0.87-3.43	1.13, 0.73, 0.57-2.27	2.17, 0.06, 0.98-4.79	1.41, 0.35, 0.68-2.93	1.03, 0.95, 0.46-2.31	2.01, 0.06, 0.97-4.13
HTL+age	Past Smoker	1.65, 0.26, 0.69-3.98	1.71, 0.22, 0.73-4.00	1.10, 0.80, 0.54-2.23	1.75, 0.11, 0.88-3.46	1.14, 0.72, 0.57-2.28	2.18, 0.05, 0.99-4.84	1.42, 0.35, 0.69-2.94	1.04, 0.93, 0.46-2.34	2.02, 0.06, 0.98-4.17
HTL+age	Drink alcohol within the past 12 months	1.68, 0.25, 0.70-4.05	1.74, 0.20, 0.74-4.08	1.09, 0.80, 0.54-2.21	1.73, 0.12, 0.88-3.42	1.12, 0.74, 0.56-2.25	2.24, 0.05, 1.00-4.94	1.44, 0.33, 0.70-2.98	1.02, 0.96, 0.45-2.30	1.99, 0.06, 0.96-4.10
HTL+age	Ever drank alcohol	1.71, 0.23, 0.71-4.12	1.76, 0.20, 0.75-4.11	1.10, 0.80, 0.54-2.23	1.76, 0.11, 0.89-3.49	1.13, 0.74, 0.56-2.27	2.18, 0.05, 0.99-4.84	1.39, 0.37, 0.67-2.88	1.04, 0.92, 0.46-2.34	2.02, 0.06, 0.98-4.18
HTL+age	Total annual sales	1.76, 0.21, 0.73-4.36	1.95, 0.30, 0.82-4.61	1.22, 0.59, 0.60-2.50	1.98, 0.06, 0.98-3.99	1.34, 0.42, 0.66-2.74	2.19, 0.06, 0.98-4.87	1.53, 0.27, 0.72-3.22	1.13, 0.76, 0.50-2.58	2.08, 0.05, 1.00-4.33
HTL+age	Total animals	1.66, 0.26, 0.69-4.00	1.71, 0.22, 0.73-4.01	1.10, 0.79, 0.54-2.24	1.74, 0.11, 0.88-3.43	1.12, 0.75, 0.56-2.25	2.15, 0.06, 0.97-4.75	1.43, 0.33, 0.69-2.96	1.04, 0.93, 0.46-2.34	1.98, 0.06, 0.96-4.08
HTL+age	Time spent on someone else's farm	1.64, 0.27, 0.68-3.95	1.69, 0.23, 0.72-3.95	1.11, 0.77, 0.55-2.26	1.81, 0.09, 0.91-3.60	1.16, 0.68, 0.57-2.34	2.08, 0.07, 0.94-4.62	1.36, 0.41, 0.65-2.83	1.05, 0.90, 0.46-2.83	2.07, 0.06, 1.00-4.29
HTL+age	% of time spent farming	1.71, 0.23, 0.71-4.13	1.80, 0.18, 0.77-4.24	1.16, 0.68, 0.57-2.37	1.72, 0.12, 0.86-3.41	1.13, 0.73, 0.56-2.29	2.12, 0.07, 0.96-4.73	1.38, 0.39, 0.66-2.89	1.09, 0.84, 0.48-2.47	1.98, 0.07, 0.96-4.08

Three Variable Models for Categorical Variables—Binaural Averages

Model	Third Variable	Adjusted ORs, p-values, 95% CI							
		500	1000	2000	3000	4000	6000	8000	Worse Ear
HTL+age	Marital Status	2.36, 0.04, 1.04, 5.35	2.83, 0.01, 0.51-1.20	1.26, 0.56, 0.59-2.70	1.88, 0.08, 0.93-3.82	1.29, 0.49, 0.62-2.67	2.67, 0.04, 1.03-6.91	1.21, 0.63, 0.56-2.61	1.64, 0.17, 0.81-3.32
HTL+age	Education	2.14, 0.07, 0.95-4.82	2.53, 0.02, 1.13-5.64	1.32, 0.46, 0.63-2.77	1.84, 0.09, 0.95-1.00	1.23, 0.58, 0.59-2.54	3.00, 0.02, 1.16-7.78	1.15, 0.73, 0.54-2.44	1.76, 0.11, 0.87-3.54
HTL+age	Other Tobacco	1.90, 0.14, 0.82-4.42	2.37, 0.04, 1.03-5.46	1.20, 0.63, 0.56-2.57	1.80, 0.10, 0.89-3.66	1.23, 0.58, 0.59-2.53	2.86, 0.03, 1.11-7.38	1.32, 0.48, 0.61-2.84	1.74, 0.12, 0.87-3.50
HTL+age	Current Smoker	2.18, 0.06, 0.97-4.90	2.55, 0.02, 1.14-5.69	1.31, 0.47, 0.63-2.76	1.81, 0.10, 0.90-3.64	1.22, 0.59, 0.59-2.50	2.93, 0.03, 1.14-7.54	1.17, 0.68, 0.55-2.50	1.73, 0.23, 0.86-3.54
HTL+age	Past Smoker	2.13, 0.07, 0.95-4.78	2.55, 0.02, 1.14-5.68	1.33, 0.45, 0.63-2.79	1.82, 0.09, 0.90-3.64	1.22, 0.59, 0.59-2.50	2.96, 0.03, 1.14-7.64	1.17, 0.69, 0.55-2.48	1.75, 0.12, 0.87-3.50
HTL+age	Drink alcohol within the past 12 months	2.15, 0.06, 0.96-4.84	2.84, 0.01, 1.25-6.45	1.32, 0.46, 0.63-2.76	1.79, 0.10, 0.89-3.60	1.21, 0.61, 0.59-2.47	3.22, 0.02, 1.24-8.37	1.17, 0.68, 0.55-2.50	1.72, 0.13, 0.86-3.43
HTL+age	Ever drank alcohol	2.18, 0.06, 0.97-4.92	2.61, 0.02, 1.16-5.88	1.32, 0.46, 0.63-2.77	1.82, 0.09, 0.90-3.64	1.22, 0.60, 0.59-2.50	3.05, 0.02, 1.18-7.88	1.14, 0.73, 0.54-2.42	1.77, 0.11, 0.88-3.53
HTL+age	Total annual sales	2.22, 0.06, 0.98-5.02	2.84, 0.01, 1.25-6.45	1.46, 0.33, 0.68-3.11	2.09, 0.05, 1.02-4.27	1.43, 0.34, 0.68-2.99	2.92, 0.03, 1.13-7.55	1.27, 0.55, 0.59-2.76	2.01, 0.06, 0.98-4.10
HTL+age	Total animals	2.14, 0.07, 0.95-4.80	2.61, 0.02, 1.16-5.88	1.33, 0.46, 0.63-2.79	1.80, 0.10, 0.89-3.62	1.20, 0.62, 0.59-2.46	2.85, 0.03, 1.11-7.33	1.16, 0.70, 0.55-2.47	1.76, 0.11, 0.88-3.51
HTL+age	Time spent on someone else's farm	2.15, 0.07, 0.95-4.85	2.61, 0.02, 1.16-5.88	1.36, 0.42, 0.64-2.87	1.87, 0.08, 0.92-3.79	1.23, 0.57, 0.60-2.55	2.88, 0.03, 1.12-7.43	1.12, 0.75, 0.56-2.21	1.79, 0.10, 0.89-3.61
HTL+age	% of time spent farming	2.29, 0.05, 1.01-5.17	2.80, 0.01, 1.25-6.31	1.43, 0.36, 0.67-3.04	1.78, 0.11, 0.88-3.60	1.21, 0.61, 0.58-2.50	2.85, 0.03, 1.10-7.36	1.15, 0.72, 0.54-2.45	1.71, 0.13, 0.85-3.46